Ground-Water Resources of the Western Oswego River Basin, New York

Cayuga Lake Basin
and
Wa-Ont-Ya Basin
Regional Water Resources
Planning Boards

ORB-5
1974

Prepared by
United States Department of the Interior
Geological Survey
in cooperation with
New York State Department of Environmental Conservation

GROUND-WATER RESOURCES OF THE WESTERN OSWEGO RIVER BASIN, NEW YORK

Prepared for the
CAYUGA LAKE BASIN and WA-ONT-YA BASIN REGIONAL WATER RESOURCES PLANNING BOARDS

By

Leslie J. Crain

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

in cooperation with
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Basin Planning Report ORB-5
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OSWEGO RIVER BASIN, NEW YORK

By

Leslie J. Crain

ABSTRACT

Ground-water occurrence, aquifer yield, and geology are described for the 2,600-square mile area of the Western Oswego River basin in central New York, which includes the drainage basins of the four largest Finger Lakes: Cayuga, Seneca, Keuka, and Canandaigua. Aquifer data are summarized in geologic sections, diagrams, and maximum yield maps.

Ground water is generally available throughout the basin in quantities sufficient for domestic and farm supplies and, in many places, in quantities sufficient for municipal and industrial supplies. Nine to 12 mgd (million gallons per day) of ground water is used in the basin, and several times this amount is available for future development, particularly from areas south of the four lakes and from certain areas along the Barge Canal.

The principal aquifers defined are unconsolidated glacial sand and gravel deposits in the large valleys of the southern half of the basin, where well yields of 1,000 gpm (gallons per minute) or more are possible. The most productive deposits are at the north ends of the valleys. Parts of the valleys of Fall and Sugar Creeks, where streams are in hydraulic contact with the aquifers, have potential yields of several million gallons per day. Delta deposits in similar hydraulic contact with the lakes could yield tens of millions of gallons per day.

In the northern part of the basin, the most important sources of ground water are deposits adjacent to and in hydraulic contact with the Barge Canal. Well yields of more than 1,000 gpm are obtained from these deposits, and perennial yields of 2 to 4 mgd per square mile of aquifer are possible. A Silurian shale bedrock unit containing soluble salt and gypsum yields as much as 1,000 gpm, and Devonian carbonate units yield as much as 400 gpm.

Precipitation in the area ranges from about 30 inches in the northwest to about 40 inches at higher altitudes in the southeast. Direct ground-water recharge from precipitation was computed to range from about 20 million gallons per year per square mile for areas underlain by glacial till to 262 million gallons per year per square mile for areas underlain by sand and gravel in the south.

INTRODUCTION

At present (1967) ground water is the sole source of water for 18 public-supply systems in the Western Oswego River basin and is a partial or emergency source of supply for five others. Several industries and nearly 100 percent of the rural population also depend on ground-water supplies. Although the available surface-water resources of the basin are very large, the greater distribution and generally high sanitary quality of ground water assure it an important role in the future development of the total water resources of the basin.

Purpose and Scope

The purpose of this report is to describe and evaluate geologic and hydrologic conditions controlling the ground-water resources of the Western Oswego River basin as a guide for regional planning and management of the area's water resources.

This report provides information on: (1) geologic and hydrologic conditions that control the occurrence of ground water in the basin, (2) quantity of ground water available, (3) areal distribution of available ground water, (4) influence of ground-water discharge on streamflow, and (5) ways in which the quantities of water obtained from certain water-bearing deposits may be increased.

Because future planning for the development of the ground-water resources of the basin will undoubtedly center around the most productive water-bearing deposits, areas containing these deposits have been discussed more intensively than areas having a smaller potential for ground-water development.

Chemical quality should be considered in the development of any ground-water supply. That subject will be covered in a separate report.

Acknowledgments

This report was prepared in cooperation with the New York State Department of Environmental Conservation for the Cayuga Lake Basin and Wa-Ont-Ya Basin Regional Water Resources Planning Boards.

Fieldwork and preparation of the report were under the direct supervision of Albert M. La Sala, Jr., former Chief, Areal Studies Section, and under the general supervision of Ralph C. Heath and Garald G. Parker, former District Chiefs, U.S. Geological Survey, Albany, New York.

Several individuals and organizations contributed data and background material for the study. The New York State Department of Public Works, Bureau of Soil Mechanics, provided data on numerous test borings that they had made throughout the basin. County and town highway superintendents permitted the U.S. Geological Survey to make additional test borings along county and town roads. Among the water-well contractors who gave invaluable data

on water wells are Layne-New York Company, Inc., and Messrs. Cecil and James Miller, Louis Duell, Donald Rigby, Theodore Hall, C. R. Murphy, Floyd Van Curen, James Stewart, Fred Hughson, Donald Davis, Harold Payton, Glen Amesbury, and John Brooks. Finally, much gratitude is due residents of the basin and officials of industry who permitted access to their property and gave information on their water supplies.

Location

The Western Oswego River basin, as defined in this report, includes approximately 2,600 square miles in central New York. The area of study is delineated in figure 1. All the drainage in the area is tributary to the Oswego River, although the river actually lies northeast of the study area.

The boundary of the study area is not based entirely on natural drainage divides because the Barge Canal, in the northern part of the area, represents an articifical feature that transports water between several different basins. The study area includes all the drainage into the four largest Finger Lakes (Cayuga, Seneca, Keuka, and Canandaigua) and all the drainage into that section of the Barge Canal from just west of Macedon to a point east of Savannah (fig. 2).

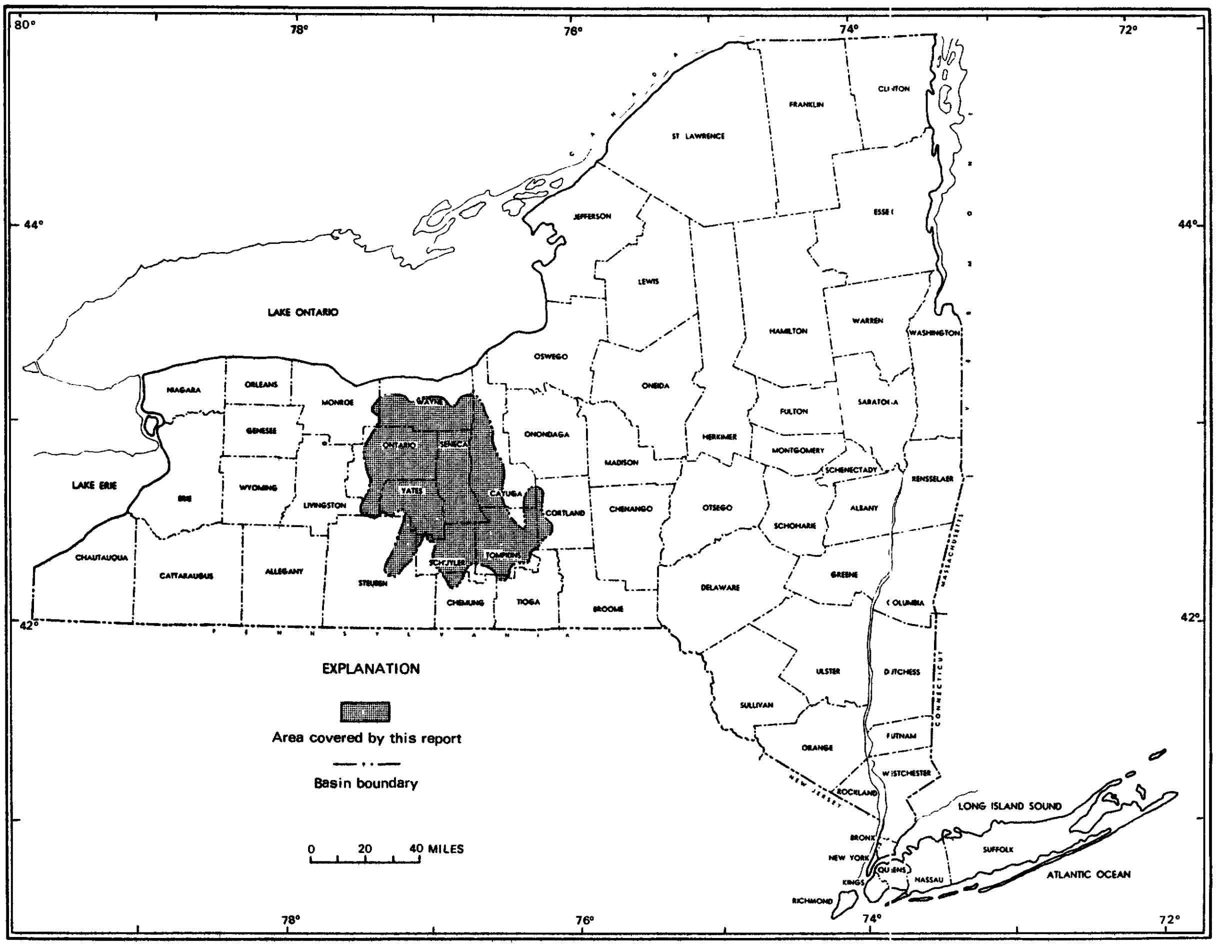


Figure 1.--Location of the Western Oswego River basin.

Ground-Water Utilization and Problems

Approximately 3 mgd (million gallons per day) of the water utilized for public supplies in the Western Oswego River basin is obtained from ground-water sources. Quantity of water used varies somewhat throughout the year because some villages use ground water only during certain periods of the year or as a supplemental supply. Public ground-water supplies in the basin and pumpage for each in gallons per day are cited in table 1.

Table 1.--Public ground-water supplies in the Western Oswego River basin and average daily ground-water pumpage

Name a/	Population served	Pumpage b/ (gallons per day)
Clyde	2,690	300,000
Dryden	1,265	100,000
Dundee	1,470	183,000
East Bloomfield	440	50,000
George Jr. Republic	160	20,000
Himrod	80	8,000
Holcomb	460	50,000
Interlaken	780	75,000
Lyons c/	4,650	700,000
Macedon	645	100,000
Manchester c/	1,345	134,000
Montour Falls c/	1,535	160,000
Naples	1,235	150,000
Newark d/	16,400	--
Odessa	560	60,000
Ovid c/	780	80,000
Phelps	875	100,000
Savannah	600	60,000
Shortsville	1,380	140,000
Trumansburg	1,770	100,000
Union Springs	1,070	100,000
Victor	1,500	230,000
Wernick Subdivision	60	10,000

a/ Locations are plotted in figure 2.

b/ Pumpage figures are supplied from published sources, (U.S. Department of Health, Education and Welfare, 1964; New York State Department of Health, 1960), by water-supply superintendents, or are estimated on the basis of population served.

c/ Ground water either supplements surface-water supply or is used seasonally.

d/ Ground water is used as standby or emergency supply only.

Locations of the public ground-water supplies in the basin are plotted in figure 2. In the past, most villages adjacent to the Finger Lakes have found it much simpler to tap the lakes than to tap the large sources of ground water that are close at hand.

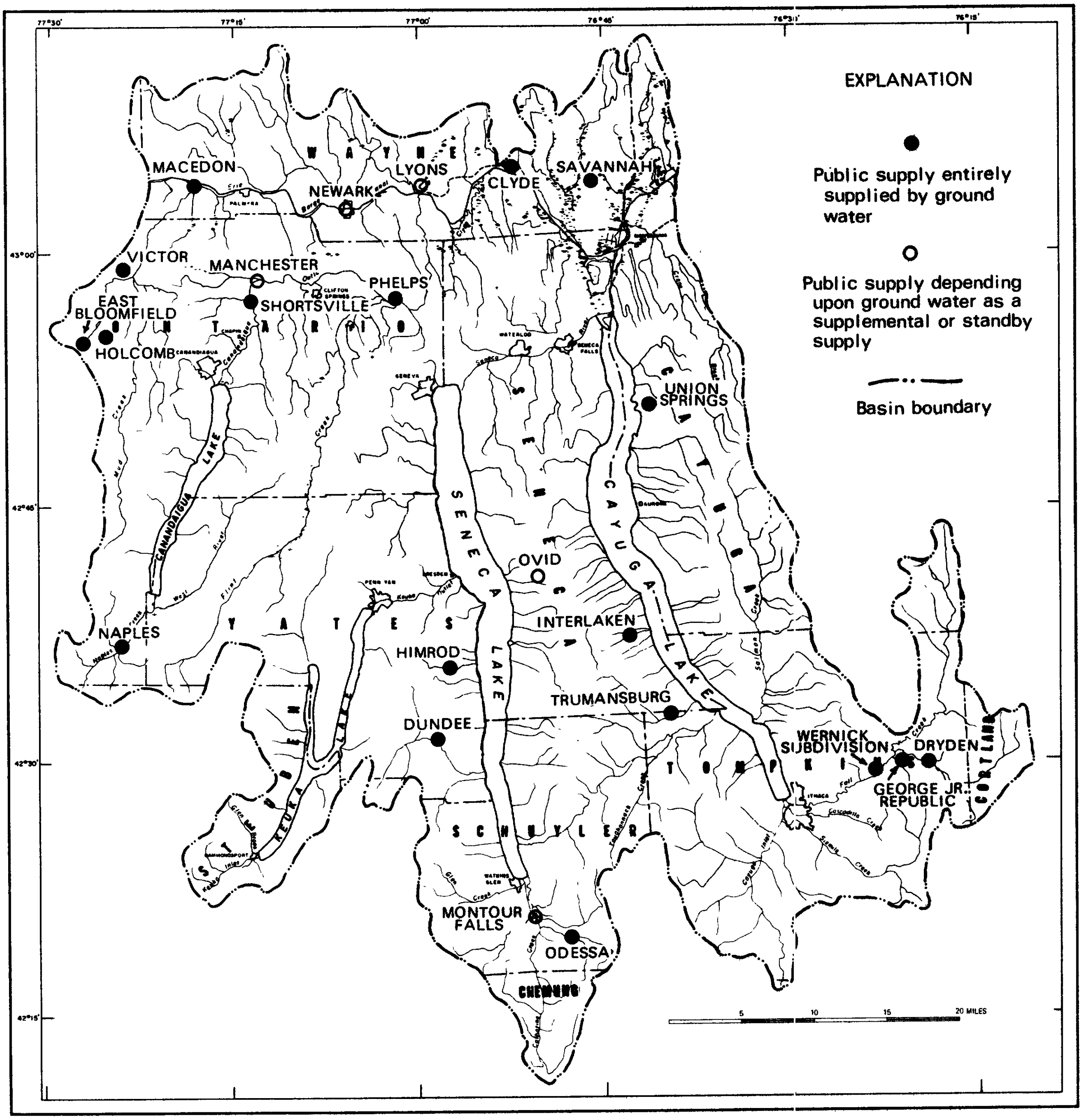


Figure 2.--Locations of public ground-water supplies in the Western Oswego River basin. (See table 1.)

Industrial use of ground water varies seasonally because much of that used in the basin is related to the food processing and winemaking industries. For example, water use by one of the larger wineries may range from less than 100,000 gpd (gallons per day) during the spring and summer to about 1,000,000 gpd during the fall, when water is needed for cooling in grape-pressing operations. Exact pumpage figures are difficult to obtain because most industries do not measure their pumpage. Estimates based on hours of pumpage, pump capacity, and type of water use, however, indicate that from 3 to 6 mgd is used by industry, depending on the season. These figures are valid only during weekdays because some industries may shut down completely on weekends and holidays. Although numerous industries contribute to the total pumpage figure, half-a-dozen industries account for about 90 percent of the total.

Accurate figures for the amount of ground water used by individual domestic and farm sources also are difficult to obtain. However, because all the rural population outside the public water-supply systems depends on ground water, the amount of water used may be estimated by considering the rural population, number of farms, and type of farm operation. Based on these estimates and an average-use figure of 100 gpd per person, approximately 3 mgd is now being used.

Approximately 9-12 mgd of ground water is being used in the basin, depending on the season. This amounts to about one-third of the total water usage in the basin.

Per capita consumption of water has been gradually increasing for many years. This increase, coupled with a general increase in population, put demands on many of the ground-water supplies in the basin that severely tested their adequacy during the drought years in the early 1960's.

Some communities depending on ground water have found their wells inadequate to supply demands and have been forced to place restrictions on water use. These communities are now faced with the choice of either developing additional wells or looking to alternate sources of supply. Likewise, population groups in some areas have grown too large for individual supplies and must now locate and develop larger sources of water. Whether because of a drought-diminished supply or the increasing use of appliances such as automatic washers, many homeowners have found that yields from their wells have become inadequate. They have the choice of carrying water from other sources, restricting water use, or drilling a new well.

Previous Studies

The geology of the bedrock in the Western Oswego River basin has been thoroughly covered by several studies. The first of these studies were surveys of the third and fourth geological districts by Vanuxem (1842) and Hall (1843), respectively. Geologic studies of individual 15-minute U.S. Geological Survey quadrangles have been published by the New York State Museum and Science Service. Quadrangles included are: Watkins and Elmira, by Clarke and Luther (1905); Geneva and Ovid, by Luther (1909); Canandaigua and Naples, by Clarke and Luther (1904); Auburn and Genoa, by Luther (1910);

Clyde and Sodus Bay, by Gillette (1940); and Penn Yan and Hammondsport, by Luther (1906). Geology of the two 7½-minute U.S. Geological Survey quadrangles covering Penn Yan and Keuka Park was described by Bergin (1964). Several reports covering individual geologic formations or units are also available. Among the more important of these are the reports on the Silurian salt by Kreidler (1957), the Tully Limestone by Trainer (1932), the Devonian rocks by Rickard (1964), gypsum deposits by Newland (1929), mining and quarrying industries by Hartnagel (1927), the Silurian rocks by Fisher (1960), and the Lockport Formation by Zenger (1965).

Perhaps the geologic report most useful to the study was the "Geologic Map of New York-Finger Lakes Sheet," by Broughton and others (1962). Because the map is a compilation of all the previous geologic work in the Finger Lakes area, it provided much of the information on bedrock geology used in this report.

Few detailed data on surficial geology and glacial deposits were available. The only intensive study was the geologic folio by Williams and others (1909). Therefore, a large part of the fieldwork was devoted to surficial mapping and collection of well logs in order to define extent and thickness of these unconsolidated deposits.

Several publications on the glacial deposits of the area were useful. The area is a classic example of many types of glacial features; glacial history and many specific features have been discussed by Fairchild (1899, 1902, 1907, and 1909); Lincoln (1892); Tarr (1905 and 1906); and von Engeln (1961). Soil surveys of the different counties in the basin by Pearson and Cline (1958), Pearson and others (1942), Lewis and others (1926), Neeley (1965), and Van Duyne (1923) were very useful in delineating the boundaries of the surficial deposits.

Published ground-water reports are available for the counties of Ontario, Seneca, Chemung, and Wayne by Mack and Digman (1962), Mozola (1951), Wetterhall (1959), and Griswold (1951), respectively. These reports were drawn on extensively in preparing this report. Many unpublished data on wells and water levels were also available from the files of the U.S. Geological Survey in Albany, N.Y.

All the information on climate is from records of the U.S. Weather Bureau and reports published by the U.S. Geological Survey and by the College of Agriculture at Cornell University. Reports on climate and precipitation of New York by Dethier (1966) and Knox and Nordenson (1955) were particularly useful.

Field Collection of Data

Most of the information on ground water and surficial geology was collected in the field. Standard methods of data collection and analysis were used to evaluate the ground-water resources of the basin.

Records of selected wells and test holes are included in table 5, and records of selected springs are included in table 6. The locations of these wells, springs, and test holes are shown in plate 1. Graphic logs of wells and test holes are shown in table 7.

Well-Numbering System

Wells, test holes, and springs are numbered according to a system based on latitude and longitude. The system has been adopted by the Geological Survey so that the number of any well will delineate its location on a world-wide basis.

The wells are located as accurately as possible, on the best maps available, and are numbered to the nearest second of latitude and longitude. In the Western Oswego River basin, 1 second of latitude and 1 second of longitude delineate a quadrangle roughly 75 feet by 100 feet. Examples are shown in figure 3. One well, plotted near the center of the figure, is at 42°32'13" north latitude and 76°17'53" west longitude. Therefore, after dropping degree, minute, and second connotations, the well number becomes 423213N0761753.1. The N signifies north latitude and the zero occupies a space that would be used for locations more than 100 degrees west longitude. The .1 at the end of the number indicates that the well is the first well located in that 1-second quadrangle. As many as nine wells may be numbered in a 1-second quadrangle.

The four numbers near each well on some illustrations in this report, such as the 13-53 in the center of figure 3, are the seconds of latitude and longitude. They are placed near the well for ease in identifying it, especially when several wells are plotted in the same block. Although grid lines on plate 1 outline 4-minute blocks, (rather than 1-minute blocks as shown in figure 3) all wells are numbered with respect to a 1-minute grid as explained above.

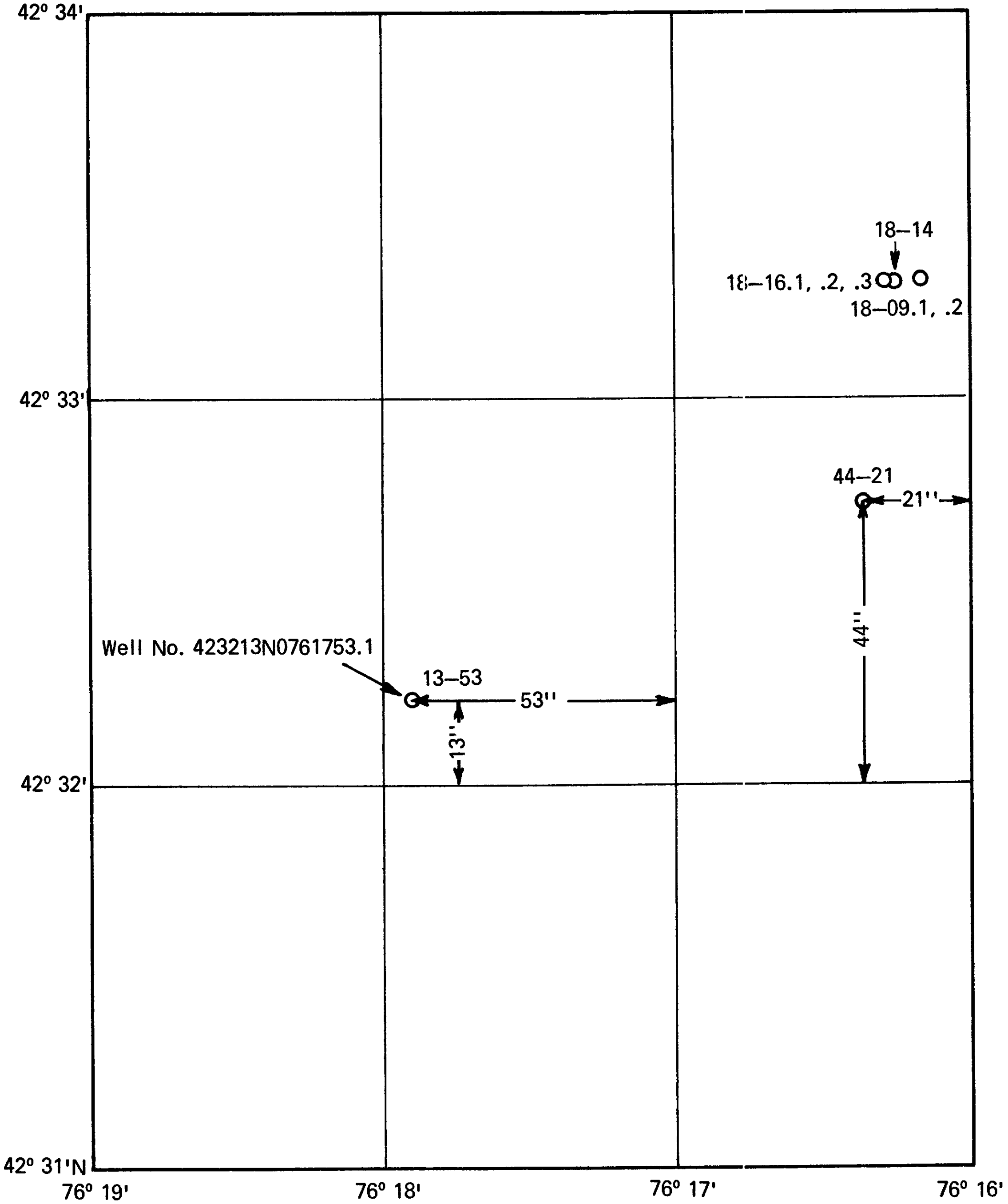


Figure 3.--Well-numbering system.

PHYSICAL SETTING OF THE BASIN

The physical features of an area greatly affect the distribution of water, both above and below the ground. The Western Oswego River basin lies in two physiographic provinces that have been termed the Central Lowland and the Appalachian Plateau by Fenneman (1938). The physical features of the entire basin and the approximate boundary between the two provinces are shown in figure 4.

Central Lowland

The Central Lowland province includes the northern part of the basin south to approximately the latitude of the northern ends of Canandaigua, Seneca, and Cayuga Lakes. The term lowland may be slightly misleading. Although the dominating feature of this area is a relatively flat surface that rises from an altitude of about 400 feet in the north to 600 feet at the southern boundary of the province, several features are superimposed on it. The most striking of these features are the numerous rounded, elliptical-shaped hills called drumlins, which rise to heights of 100 to 300 feet above the surrounding plain. Drumlins are most plentiful in the northern part of the province and were formed by the glacial ice that once moved across the area.

Immediately south of the drumlin belt, the most common surficial features are long, parallel, north-south trending ridges that were formed by the erosive action of the same ice sheets. These features give the area an undulating appearance. South of these ridges is a nearly flat area, with very little relief, that extends to the southern boundary of the Central Lowland province.

Drainage is poor, and there are many large and small swamps in the province. Most of the streams are small and sluggish and wander between drumlins and ridges. Most are intercepted by the Barge Canal, which cuts across the area from west to east. In general, the canal follows the path of an old glacial stream channel that nearly bisects the lowland. The largest streams in the province are the lake outlets. Where the Seneca River joins the Barge Canal near Montezuma, the combined flow represents the entire surface-water discharge from the basin.

Appalachian Plateau

In the approach to the southern edge of the Central Lowland, there is a gradual, almost imperceptable increase in altitude. As the land rises, the topography gradually changes until it consists of rolling hills and uplands with large and broad stream and lake valleys lying between them (fig. 4). Such topography is typical of the Appalachian Plateau. Hills and uplands in this province reach a maximum altitude of about 2,100 feet in the southern part of the basin and are dissected by many small, steep-sloped valleys.

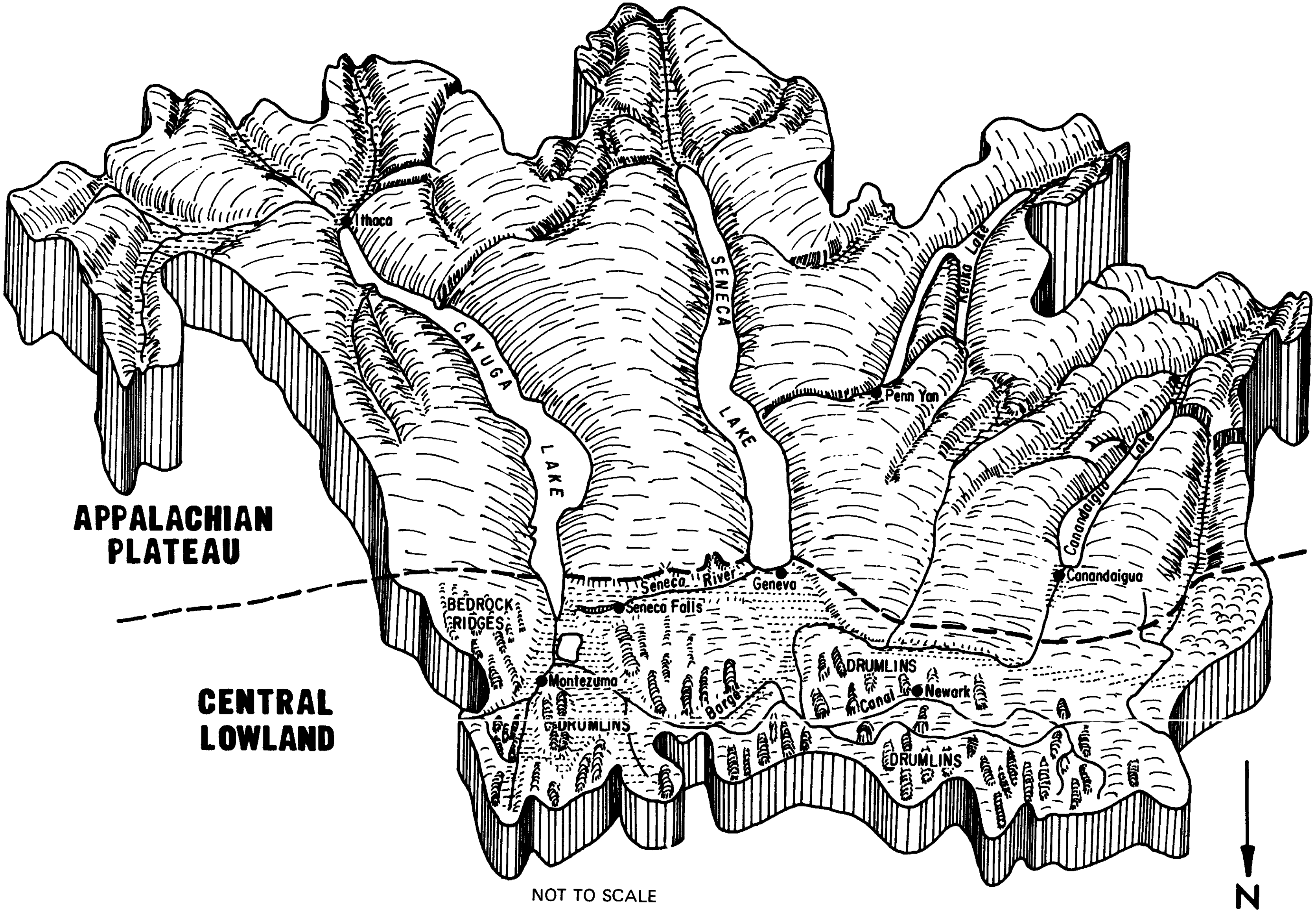


Figure 4.--Physical features of the Western Oswego River basin (looking southward from a position over Lake Ontario).

The most impressive features of the Appalachian Plateau are the long, deep valleys containing the four largest Finger Lakes. These lakes lie in ancient stream valleys that were modified and deepened by glacial erosion. Three of the lakes extend from the Central Lowland, where relief along the shores is low, far south into the Appalachian Plateau, where the surrounding hills reach elevations of as much as 1,700 feet above the lake surfaces. The valley walls along the lakes are smooth except for the deep gorges formed by small streams draining the uplands. Most of the streams in the Appalachian Plateau have steep gradients but are short because they are intercepted by the lakes before they have an opportunity to reach any great length. The lakes themselves are very deep; for example, depth of Seneca is more than 600 feet and Cayuga more than 400 feet. Although the depth of fill under the lakes is unknown, the actual relief of the bedrock surface in the area may exceed 3,000 feet. The lakes, because of their great areas and depths, provide some of the largest volumes of water storage in the State.

HYDROGEOLOGY

Because rocks provide "reservoirs" and "pipelines" in which ground water is stored and through which it moves, the ground-water hydrology of the Western Oswego River basin cannot be discussed without an understanding of the geology of the basin.

Geologic Framework

The geologic framework may be divided into two general types of geologic units for simplicity of discussion: (1) the bedrock or consolidated rocks; and (2) the unconsolidated deposits, which overlie the bedrock nearly everywhere.

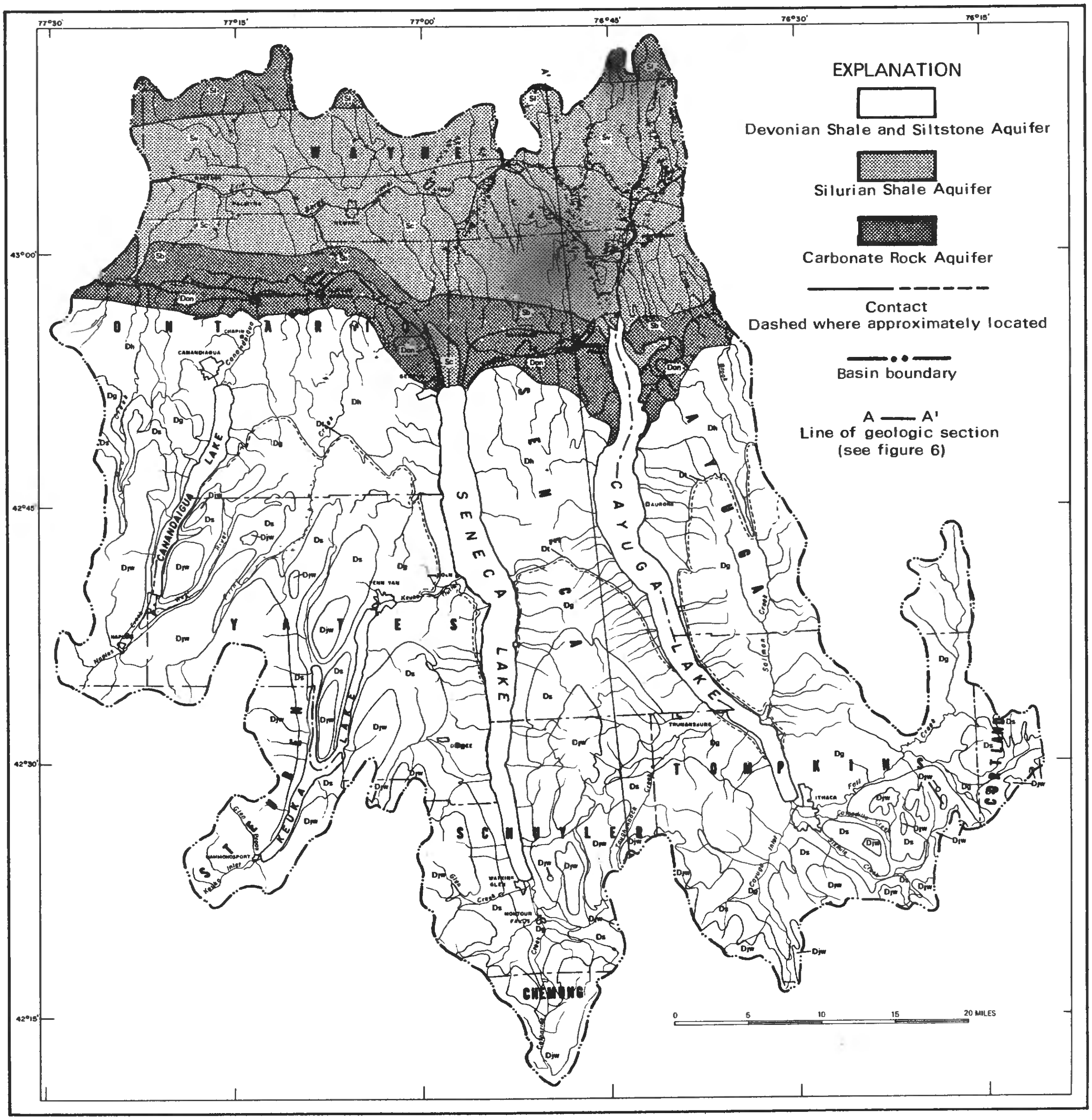
Bedrock

The bedrock underlying the area consists of shale, siltstone, sandstone, limestone, and dolomite. Some of the rock units contain gypsum and salt, and all contain recognizable layers or beds ranging from less than an inch to several feet in thickness. A brief discussion of the history and the physical character of the rocks is helpful in understanding their importance to the hydrology.

History and occurrence

Formation of the bedrock began when unconsolidated sediments such as clay, silt, fine sand, and calcium carbonate were deposited in seas during the Devonian and the Silurian Periods of the earth's history, approximately 350 to 440 million years ago. These sediments accumulated to tremendous thicknesses. During the Silurian Period, arid conditions sometimes prevailed; and the seas shrank in size and partially dried up. As the sea evaporated, the minerals in the sea water became more concentrated, and salt and gypsum were precipitated. Eventually, the sediments hardened into beds of solid rock. After a period of time, the rocks were uplifted above the sea and then were partially eroded away. In some parts of the area, the rocks have also been gently folded or even faulted; this has resulted in some vertical displacement of the beds. Today, the beds of rock generally dip to the south at about 50 feet per mile and crop out in east-west belts across the basin as shown in figure 5. From north to south through the basin, progressively younger rocks are exposed and older rocks are buried deeper beneath the younger rocks (fig. 6).

The beds of rock can be combined into recognizable formations on the basis of age, composition, and physical appearance (fig. 5). A generalized stratigraphic column of the bedrock formations in the Western Oswego River basin is shown in figure 7. However, the assignment of names to these rocks does not mean that each formation has a uniform composition and character. In fact, great differences in thickness and composition may be found within each formation. Figure 7 shows that the composition of most of the rock formations is more complex than the names imply. For example, the Lockport Dolomite is not a pure dolomite at all but contains extensive beds of limestone and shale. Likewise, the Camillus Shale contains important beds of limestone, salt, and gypsum.



Geology modified by L. J. Crain from Broughton and others, 1962

EXPLANATON

DEVONION

- Djw — Java and West Falls Formation
- Ds — Sonyea Formation
- Dg — Genesee Formation
- Dt — Tully Limestone
- Dh — Hamilton Group
- Don — Onondaga Limestone (including Helderberg Group and Oriskany Sandstone)

SILURIAN

- Sb — Silurian Carbonate Rock (including Cobleskill Limestone, Bertie Limestone, and Arkon Dolomite)
- Sc — Camillus Shale
- Sv — Vernon Shale
- Sl — Lockport Dolomite

Figure 5.--Bedrock geology of the Western Oswego River basin.

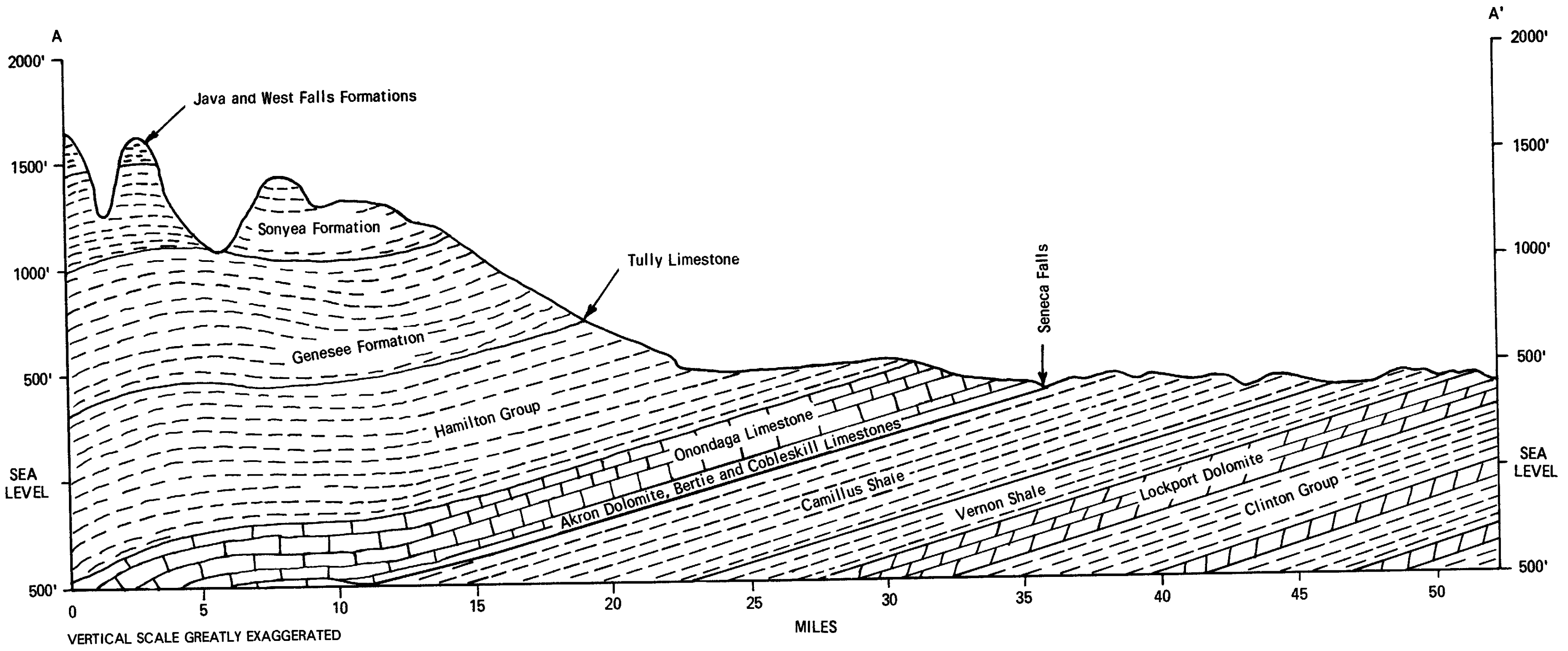


Figure 6.--Geologic section; line of section shown in figure 5.

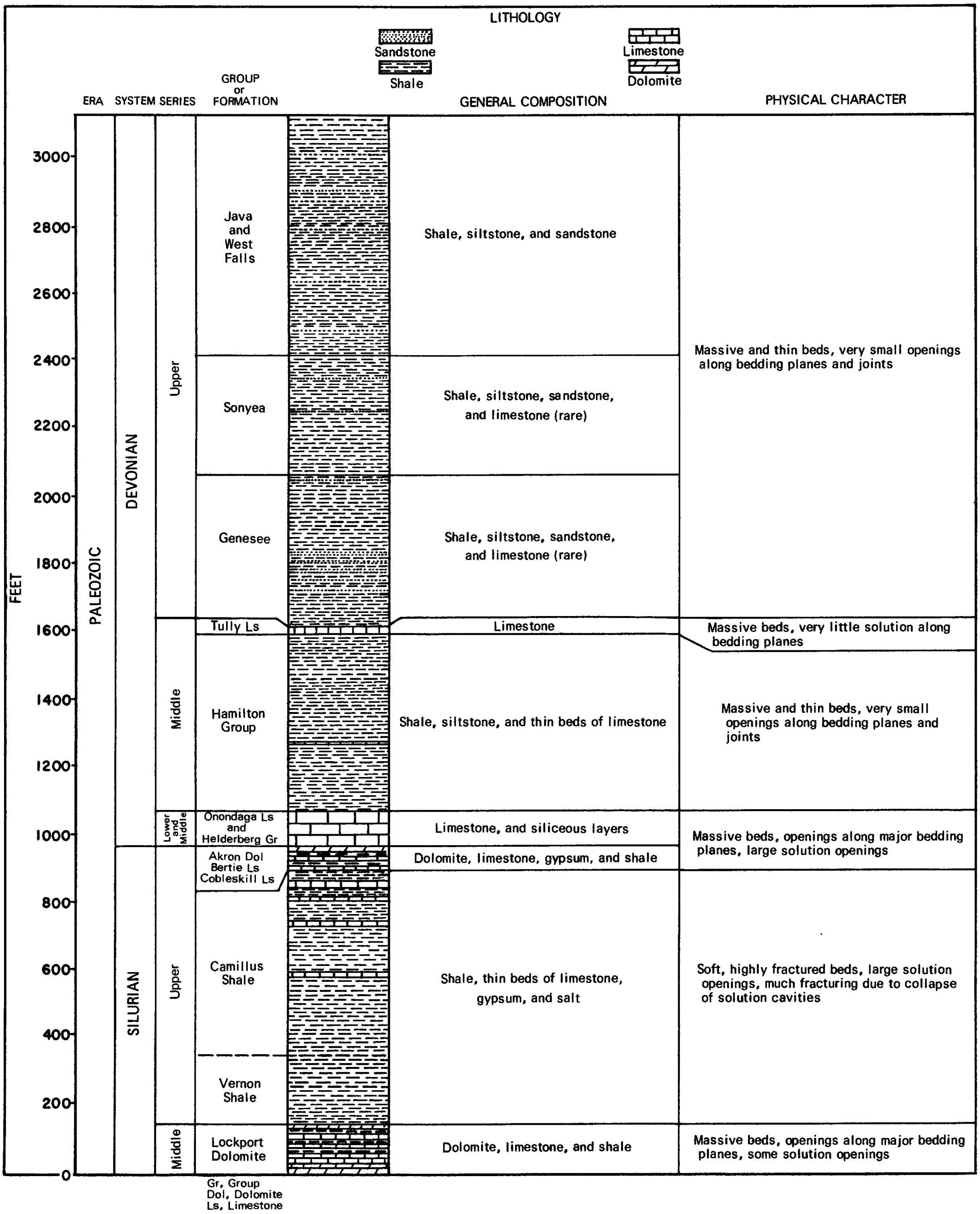


Figure 7.--Generalized stratigraphic column of bedrock in the Western Oswego River basin.

Physical characteristics

As previously mentioned, all the bedrock units in the basin are composed of tabular layers or beds ranging from less than an inch to several feet in thickness. These beds of rock are divided into many irregular blocks by a series of fractures, or joints, that are perpendicular to or at an angle to the bedding planes. Many of the joints are several hundred feet in both depth and length. Bedding and jointing are structural features common to all the rocks in the basin. However, these features vary considerably among rock units because of differences in composition, solubility, and rock strength.

In addition to the geologic formations, the rocks also may be classified into three types (fig. 7) according to similar physical properties. These three types are: (1) shale, siltstone, and sandstone; (2) carbonate rocks; and (3) shales containing soluble rocks. The hydrologic significance of the classification will become apparent in the sections of this report, "Hydraulic Character of Bedrock and Unconsolidated Deposits" and "Availability of Ground Water."

Shale, siltstone, and sandstone.--Rocks of this type include the Java, West Falls, Sonyea, and Genesee Formations and the Hamilton Group and are found in the southern half of the basin (figs. 5, 6, and 7). These formations also include some minor beds of limestone; the most notable of these beds is the Tully Limestone. However, the limestone beds are not thick enough to affect significantly the physical character of this type bedrock as a whole.

Shale, siltstone, and sandstone are commonly interbedded. Thickness of the individual beds depends on the composition of the rock. Shales are generally thin bedded and fracture and crumble easily in exposures. Siltstones and sandstone are usually more massive and more resistant to erosion and, where they are interbedded with shale, tend to protrude from an exposure.

Despite other differences, all these units contain similar openings. The only openings are along bedding planes and joints, and all such openings are minute. Therefore, these rocks appear "solid" except for the tiny, paper-thin openings along the bedding planes and joints. A block of these rocks, as it might appear if quarried in one piece, is shown in figure 8. The openings along these fractures are greatest near the land surface. At depth, the weight of the overlying rocks tends to close the openings.

Carbonate rocks.--The carbonate rocks consist of the Akron Dolomite, Cobleskill Limestone, Bertie Limestone, Onondaga Limestone, and Lockport Dolomite. The first four crop out in the middle part of the basin, and the last in the north (figs. 5, 6, and 7).

The carbonate rocks tend to occur in massive beds (up to a few feet in thickness). As other bedrock units, the carbonates are jointed; however, because they are composed of materials that are slightly soluble (calcite and dolomite), their physical character is much different from that of the other rocks. As shown in figure 8, the original openings along joints and bedding planes have been enlarged through the solution of the rock by

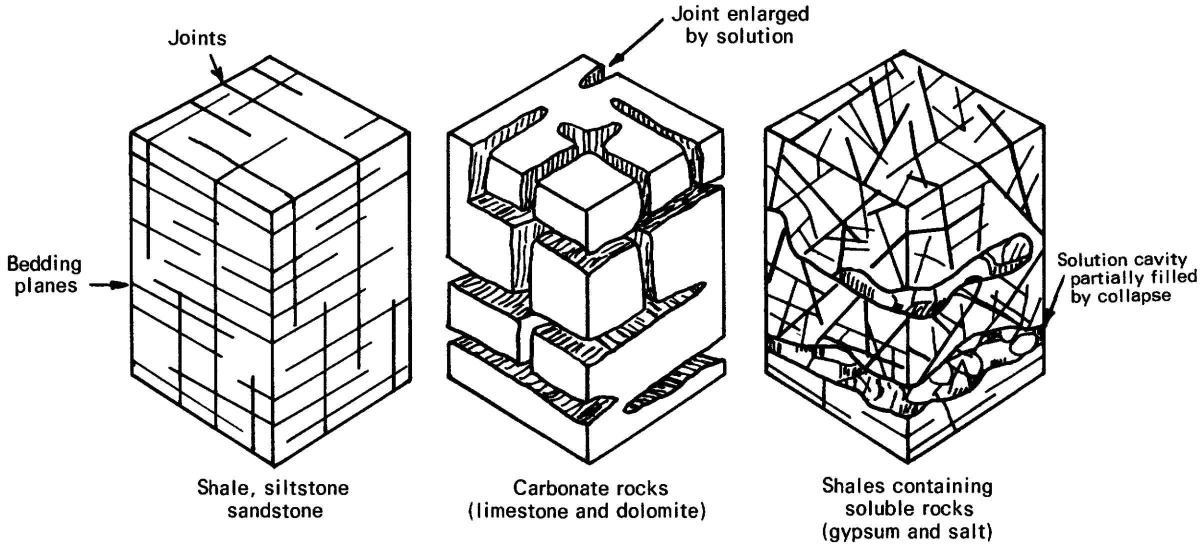


Figure 8.--The most common water-bearing openings in the types of bedrock in the study area.

circulating ground water. Many of these openings are several inches in width, and their size is roughly proportional to the amount of ground water that is moving or has moved, through them. Therefore, the carbonate rocks near the surface, where ground-water circulation is greatest, may contain large openings. Where the rocks are deeply buried and where the ground water is already saturated with chemical constituents dissolved from overlying rocks, the openings may be small. At even greater depths than these, openings in carbonate rocks may be restricted to the same minute size in shale, siltstone, and sandstone.

Carbonate rocks are usually strong enough to maintain a bridge over any voids or solution openings that develop. However, if solution removes an exceptionally large volume of rock, the overlying beds may collapse and cause depressions in the land surface called "sinkholes." Many small sinkholes were observed in the zone of carbonate rock outcrop southeast of Seneca Falls and northeast of Cayuga Lake.

Shales containing soluble rocks.--Although composed mainly of shale, the Camillus and the Vernon Shales (figs. 5, 6, and 7) contain extensive beds of gypsum and common salt, minerals that are very soluble in water. In fact, all the salt has been dissolved from the formations in the area where they crop out and for some distance south of the outcrop. Gypsum is not quite so soluble as the salt, and much of it still remains in the outcrop area. However, this also is being dissolved at a fairly rapid rate.

Removal of soluble minerals in the rocks accounts for large solution cavities in the shales. However, the shales are not so strong as the carbonate rocks and in many places cannot support the overlying rock where considerable salt and gypsum have been removed by solution. Therefore, collapse of the overlying rocks is common and has resulted in partial filling of some of the solution cavities and additional fracturing of the rocks, as shown in figure 8. Such collapse has also caused numerous sinkholes to

form in some areas, as in the outcrop belt of the carbonate rocks east of Cayuga Lake. Though appearing at the surface in the thin layer of carbonate rocks, the sinkholes are actually caused by the solution of gypsum from the Camillus Shale, which underlies the carbonate rocks.

Unconsolidated Deposits

The unconsolidated deposits consist of sand, gravel, clay, silt, and varying mixtures of these. To a casual observer the deposits seem to occur in a random fashion throughout the basin. Therefore, a brief discussion of the history of their origin will be beneficial in understanding why they occur where they do and why their composition is variable.

History of deposition

Within the last 1,000,000 years, New York was invaded by continental ice sheets that spread southward from Canada. The Western Oswego River basin shows the effects of the glacial erosion and deposition that resulted from these ice invasions. The ice sheets reduced the bedrock surface in altitude, smoothed over the uplands, and scoured out existing valleys. Additional erosion was caused by water released as the ice melted. Large lakes were formed in valleys at the margin of the ice, and overflow from many of the lakes cut channels across divides in the uplands. Lake water released in the northern part of the area eroded long sinuous channels.

One of the most significant effects of the glaciation was the deposition of the rock debris that had been incorporated in the ice. Because each ice advance modified, and largely destroyed, the deposits of previous advances, most of the glacial deposits in the basin owe their origin to the last glaciation of the area. The ways in which some of the various deposits may have been formed as this last ice sheet advanced over and then gradually disappeared from the area are shown in figure 9.

The ice sheet as it may have looked when it advanced into the northern part of the basin is shown in figure 9A. As the ice moved, it eroded away some of the bedrock and most of the pre-existing unconsolidated deposits. Much of this material was incorporated in the sole of the ice. The ice became overloaded with this debris and a veneer of unsorted rock material, glacial till, was "plastered" down on the land surface and then was overridden by the ice sheet. Many large masses of till were laid down by the ice sheet in the shape of streamlined deposits called "drumlins." Some of these deposits reach a height of 200 feet above the surrounding land. Drumlins are characteristically shaped like half of an airfoil whose steep end faces the direction of ice advance. An examination of drumlins and small streamlined hills north of Seneca Falls revealed that the cores of most of them contain sand and gravel or other coarse-grained materials. Apparently, the advance of the ice sheet across coarse-grained glacial deposits rapidly overloaded the sole of the ice with large amounts of debris that could not be transported. Much of this material was deposited as a part of the drumlin and then was smoothed over with till.

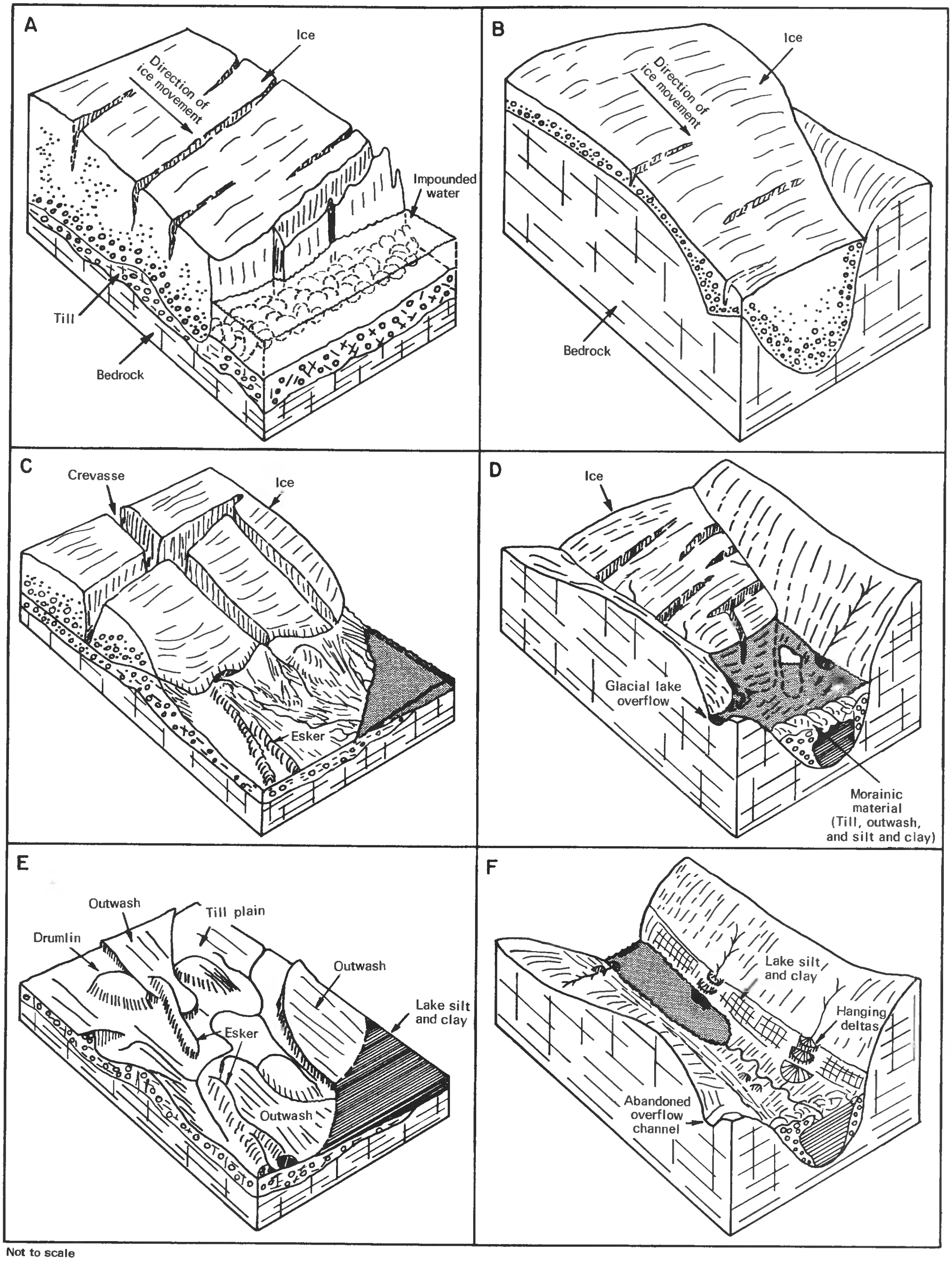


Figure 9.--How typical glacial deposits were formed in the Western Oswego River basin.

The advance of the ice sheet into one of the deep valleys in the southern part of the basin is shown in figure 9. Again, erosion was the principal result of the ice-sheet advance; the effect was greatest in the valley bottom, where the ice was the thickest.

Sometime after the ice had advanced to a position south of the present lakes, it began to stagnate and retreat--the rate of advance from the north could not keep up with the rate of melting at the south end. This had the net effect of the ice front receding to the north. The ice first melted away from the uplands, where it was thinnest, but it persisted in the valleys for a considerably longer time. A fair balance between the forward movement of the ice and melting existed for a period of time in the valleys at the south end of the basin. This resulted in material being transported to the end of the ice tongue and being deposited. Great thicknesses of material were deposited directly by the ice, by glacial melt water, and by sedimentation in lakes to form "moraines." The ice margin then receded fairly rapidly to the north. The recession was interrupted only by a few minor stillstands or readvances of the ice.

Ice tongues as they may have appeared as they retreated back up the valleys, are shown in figure 9D. In front of them, large moraines mark the period of fairly long stagnation in the valleys. As the ice shrank back in the valleys, large lakes several hundred feet higher than the present lakes were formed by ice dams to the north. Silt and clay settled out in the still waters of these lakes, and delta deposits were formed by the tributary streams entering along their shores.

The northern part of the basin as it may have looked as the ice melted back through that region is shown in figure 9C. Large bodies of stratified, coarse-grained outwash material were deposited by melt water in front of the ice. Coarse materials laid down in streams running under stagnant ice formed long, sinuous deposits of sand and gravel that often extend for many miles. These deposits are termed "eskers." In many places, sand and gravel were deposited adjacent to the ice itself, either as deltas by streams running over or under the ice or in stream channels along the ice tongues. When the ice melted away, these deposits slumped into irregular masses termed "kames." Where depressions in the land surface existed or drainage was blocked by melting ice, shallow lakes were formed and silt and clay were deposited. The drumlins were exposed by the melting ice and remained in nearly their original form.

When the ice withdrew to a point north of the present location of the Barge Canal, water from an impounded glacial lake to the west was released to flow eastward into a lake at a lower altitude. This flow of water eroded a channel through the till plain and drumlins in the northern part of the basin from around Macedon to Clyde. Many of the drumlins were destroyed, and outwash deposits were reworked.

Some of the deposits typical of the Central Lowland and the Appalachain Plateau physiographic provinces after the ice had left are shown in figures 9E and 9F. In the north part of the basin (fig. 9E) is the till plain with scattered drumlins and deposits of glacial outwash. The lower-lying areas contain lake deposits of silt and clay and a few eskers or eskerlike deposits.

Most of the silt and clay is now overlain by recent organic deposits of muck and peat. In the south part of the basin (fig. 9F), the southernmost ends of the valleys are blocked by large terminal moraines. Flat areas that consist mainly of lake deposits lie south of lakes that are remnants of larger glacial lakes. Along the sides of the valleys are thin lake deposits and multiple delta deposits that were formed in the older, higher lakes. These deltas, which mark different stages of the lakes, are now left stranded on the valley walls and are termed "hanging" deltas.

Erosion of the bedrock and unconsolidated deposits has continued since the ice left the area. The numerous gorges cut into the hillsides along the lakes in the basin are examples of recent erosion.

Recent deposition has taken the form of silt, sand, and sand and gravel that have been laid down in the low-lying valley areas by the present streams. Deltas are still being expanded by streams carrying sediment into the lakes. Deposits of silt and clay are forming in the lakes in the basin, as are deposits of muck and peat in the numerous ponds and swampy areas.

Physical characteristics and occurrence

Physical character and occurrence of the unconsolidated materials are directly related to their manner of origin. During this investigation, the deposits at the surface were mapped according to the predominant size of their individual grains, such as sand and gravel or silt and clay. Poorly sorted mixtures of several grain sizes were mapped as till or alluvium.

Sand and gravel.--Because they are among the heaviest particles carried along by a stream of water, sand and gravel are also among the first to be deposited when the velocity of the water declines. Most smaller particles of silt and clay are carried farther along by the slackening current.

As shown in figure 10, a deposit of sand and gravel is usually sorted in layers of nearly uniform-size materials; many of these layers are interbedded. Magnification of a small part of the sand and gravel in figure 10 shows the arrangement of the individual grains. Because the grains are touching in only a few places and little fine material is found with them, from 20 to 30 percent of the deposit is composed of voids or open spaces. The size of these openings may range from a few thousandths of an inch in fine sand to an inch or more in coarse gravel.

Most of the sand or the sand and gravel in the basin occurs as outwash, kames, eskers, or deltas that were formed at the time of glaciation, as discussed in the section, "History of Deposition."

The outwash consists of broad, fairly flat-surfaced deposits of sand and gravel. These deposits are extensive near Macedon and Palmyra and in the large valleys at the extreme southern end of the basin. Most of the outwash in the basin is less than 30 feet in thickness and overlies other glacial deposits. However, layers of outwash are also buried beneath, or interbedded with, some lake deposits. Some of these layers are 200 feet or more below land surface.

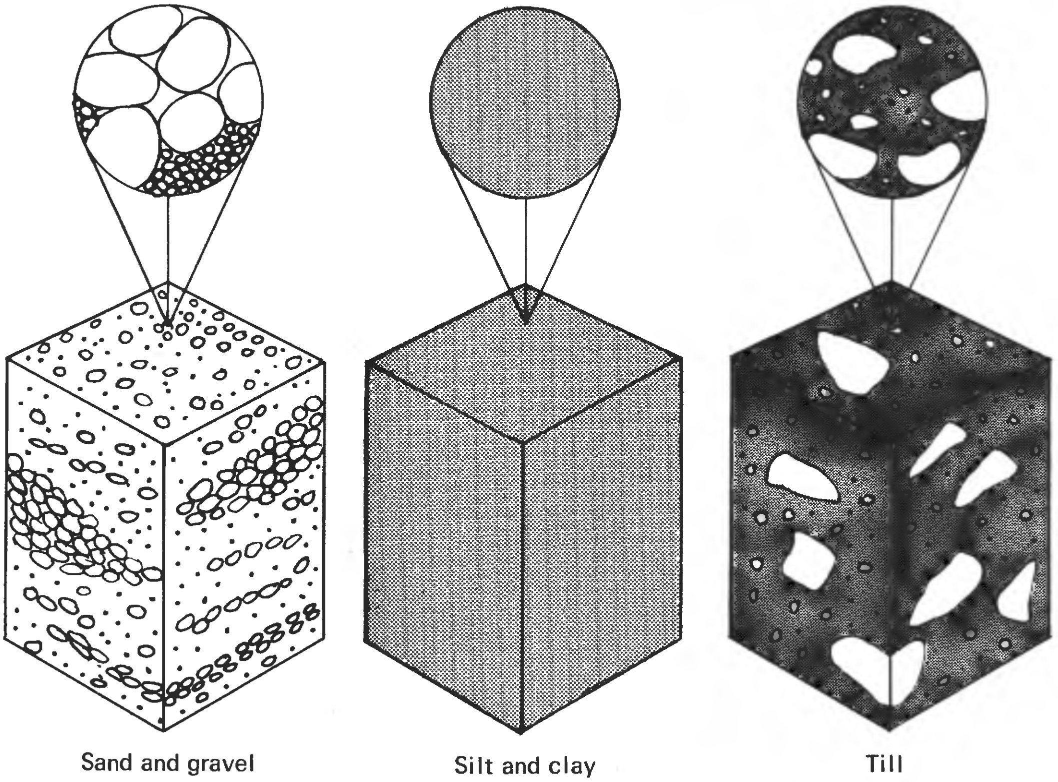


Figure 10.--General character of some selected unconsolidated deposits in the Western Oswego River basin.

Kame deposits are scattered throughout the basin. They have irregular surfaces, and many have considerable relief. Some of the most prominent kame areas are south of the four lakes and in the northwestern part of the basin, near Victor.

Eskers are somewhat harder to identify because they may be masked by other features, but they may show up as long, winding sand and gravel deposits. One that can be recognized on topographic maps runs from north of the city of Newark, south through Newark, and then to a point east of Phelps for a total distance of about 15 miles. Deltaic deposits are extremely common in the basin and are easy to recognize. They include the sand and gravel along the valley walls of all the lakes in the basin, especially around Ithaca, Watkins Glen, and Hammondsport.

Silt and clay.--Deposits of silt and clay are formed when very small particles of rock material (0.002 inch or less in diameter) settle out in standing bodies of water. Many of the deposits are separated into individual layers of silt and of clay. The way a block of a silt and clay deposit would appear is shown in figure 10. The size of the particles is such that the block appears as one solid mass. Even when magnified the individual grains and the spaces between them are difficult to see. All openings in the silt and clay are extremely small, even though in total they may exceed the amount of void space in an equal volume of sand and gravel.

Many of the lower-lying areas of the basin contain lake deposits of silt and clay. Numerous small deposits are scattered throughout the basin, especially in the northern half. Some of the larger lake deposits are northwest of Canandaigua, east of Seneca Falls, along Flint Creek, and south of all four lakes. Many of the lake deposits south of the lakes are several hundred feet thick.

Some thin deposits of silt and clay also appear along the walls of the large valleys, where they were deposited in the deeper glacial lakes that existed in the valleys. The most notable of these are south of Cayuga Lake. Although such high-level lake deposits are common along the valley walls of all the lakes, most of them are thin and difficult to distinguish from clay-rich till.

Muck and peat have been deposited in many post-glacial swamps and lakes in the basin. These deposits, like the silt and clay they commonly overlie, are of little importance as sources of water. However, extensive deposits of muck along Flint Creek, and north of Cayuga Lake, form extremely important agricultural areas.

<u>Till</u>.--Till was deposited directly by the ice sheet without running or standing water acting as a sorting medium. Therefore, the till deposits are heterogeneous mixtures of all grain sizes from boulders to clay. Because of the weight of the ice riding over the deposits at the time of deposition, they are also dense and compact. Although the till contains many sand- and gravel-size particles, the spaces between them are filled with smaller grains of silt and clay (fig. 10). Therefore, the openings in the till are small; and most of the till seems to be almost as solid as the silt and clay.

Glacial till is one of the most widespread unconsolidated deposits in the basin. Indeed, it is found almost everywhere in the basin, although covered by other deposits in many areas. It is the only unconsolidated deposit covering the bedrock in most upland areas, as shown in plate 2. The till is thickest where ice movement was perpendicular to existing stream valleys, and in drumlins. In these places, the till may be as thick as 200 feet.

Hydraulic Character of Bedrock and Unconsolidated Deposits

Because bedrock and unconsolidated deposits act as both reservoirs and pipelines to store and move water, their physical characteristics have a direct bearing on the quantity of water that can be stored, how fast the water can move, and how much water can be withdrawn by wells.

As Reservoirs

The amount of water that can be stored in bedrock and unconsolidated deposits is directly proportional to the number and size of openings that the rocks contain. The percentage of a given volume of rock or unconsolidated deposit that consists of voids is termed "porosity." The porosity of earth materials ranges from near zero to more than 50 percent. The examples

of physical characteristics of the different types of rocks (figs. 8 and 10) also illustrate some of the relative porosities of the materials.

As shown in figure 8, nearly all the openings in the shale, siltstone, and sandstone are fractures along bedding planes and vertical joints. Because the total volume of these openings is small, the porosity of the rock as a whole may be only 1 or 2 percent. In carbonate rocks, solution openings may be much larger; and these rocks may have porosities of 20 percent or more.

Porosity of the sand and gravel may be 30 percent or more because of the large pore spaces between individual grains. Although the pore spaces between the individual grains in the silt and clay deposits are extremely small, the porosity may still be 50 percent or more because of the large number of pores.

Therefore, as reservoirs for the storage of water, the various materials in the basin may contain from almost zero to more than 50 percent of their total volume as water. However, of importance is the amount of this storage that can be recovered from them. The amount of water that will drain freely from a given volume of bedrock or unconsolidated deposit is called "specific yield" and is expressed as a percentage of the total volume of the water-bearing material. The amount of water that is retained in the void spaces by molecular attraction is called "specific retention." This is also expressed as a percentage of the total volume. For example, if a saturated block of sand and gravel with a porosity of 30 percent were allowed to drain freely, it might have a specific yield of 27 percent (or 90 percent of all the water it contains). Therefore, the specific retention would be 3 percent (or 10 percent of the original water). In general, the larger and better connected that the openings in a material are, the greater the specific yield. Materials such as silt and clay, which have small pore spaces, may have specific yields of less than 1 percent and specific retentions of more than 50 percent.

To make a quantitative evaluation of the amount of water available in any material, the term "storage coefficient" is used. The storage coefficient of an aquifer is defined as the volume of water it releases from or takes into storage per unit surface area of the aquifer per unit change in the component of head normal to that surface.

As Pipelines

There is no direct relation between the volume of water in a rock or unconsolidated deposit and the quantity of water that can move through the rock. The rate at which water will move through a material is primarily dependent on the size and the interconnection of the openings, not their total volume. The larger the openings, the greater the rate of flow of water through them. In fact, as the openings in the material become very small, the friction resulting from the water moving through them may become so great that the flow is almost completely stopped.

The ability of a material to transmit water is known as its "permeability." The greater the permeability of a material, the more readily water moves through it. Relative permeabilities of different materials in the basin are illustrated in figure 11. Each block of material in the figure is shown as if it blocked one end of a transparent, rectangular trough. Therefore, one can see how effectively each material would act as a "plug" in holding back the water in the trough.

The block of shale, siltstone, and sandstone in figure 11 effectively dams the end of the trough. This indicates a low permeability. Only a small quantity of water moves through the fractures in the block. On the other hand, water pours through the block of carbonate rock because the large interconnected solution openings offer little resistance to the movement of water.

The block of silt and clay effectively retards the flow of water through it. Pore spaces in the silt and the clay are so small that the block is nearly impermeable and almost completely stops the flow of water. The block of sand and gravel, however, because of its much larger pore spaces has a high permeability, and water flows rapidly through it.

The general concept of permeability is useful when discussing the relative water-transmitting properties of various materials. However, a more precise definition of permeability is used for quantitative description of the rate of water movement through various materials. Permeability of both bedrock and unconsolidated deposits may be expressed as the number of gallons of water that will move in 1 day through a 1 square-foot area under a hydraulic gradient of 100 percent (1 foot drop in head for each foot of horizontal movement) at 60°F. The term for this expression is "coefficient of permeability." However, for simplification in this report, whenever a quantitative value is used it will be referred to simply as permeability.

The range of permeabilities of the bedrock and unconsolidated deposits is great, owing to the physical differences among the various materials. As an example, the permeability of a clay deposit may be as low as 0.001 gpd per sq ft (gallons per day per square foot), and the permeability of a coarse gravel deposit may be as much as 100,000 gpd per sq ft. In this example, the gravel is 100 million times as permeable as the clay.

Another concept concerning the hydraulic properties of rocks, which is related to permeability, is that of the "coefficient of transmissibility," hereafter referred to as "transmissibility." The transmissibility of a material is defined as the quantity of water in gallons per day that may be transmitted through a section of the material 1 foot wide and extending the full saturated thickness of the material, under a hydraulic gradient of 100 percent. It is equal to the average permeability of a deposit multiplied by the saturated thickness of the deposit. For example, a deposit of sand and gravel 10 feet thick, fully saturated with water, and having a permeability of 1,000 gpd per sq ft, would have a transmissibility of 10,000 gpd per ft (gallons per day per foot).

Permeability is useful for comparing the water-transmitting properties of materials or individual beds of sand and gravel. However, transmissibility is more useful for comparing the water-transmitting properties of entire deposits.

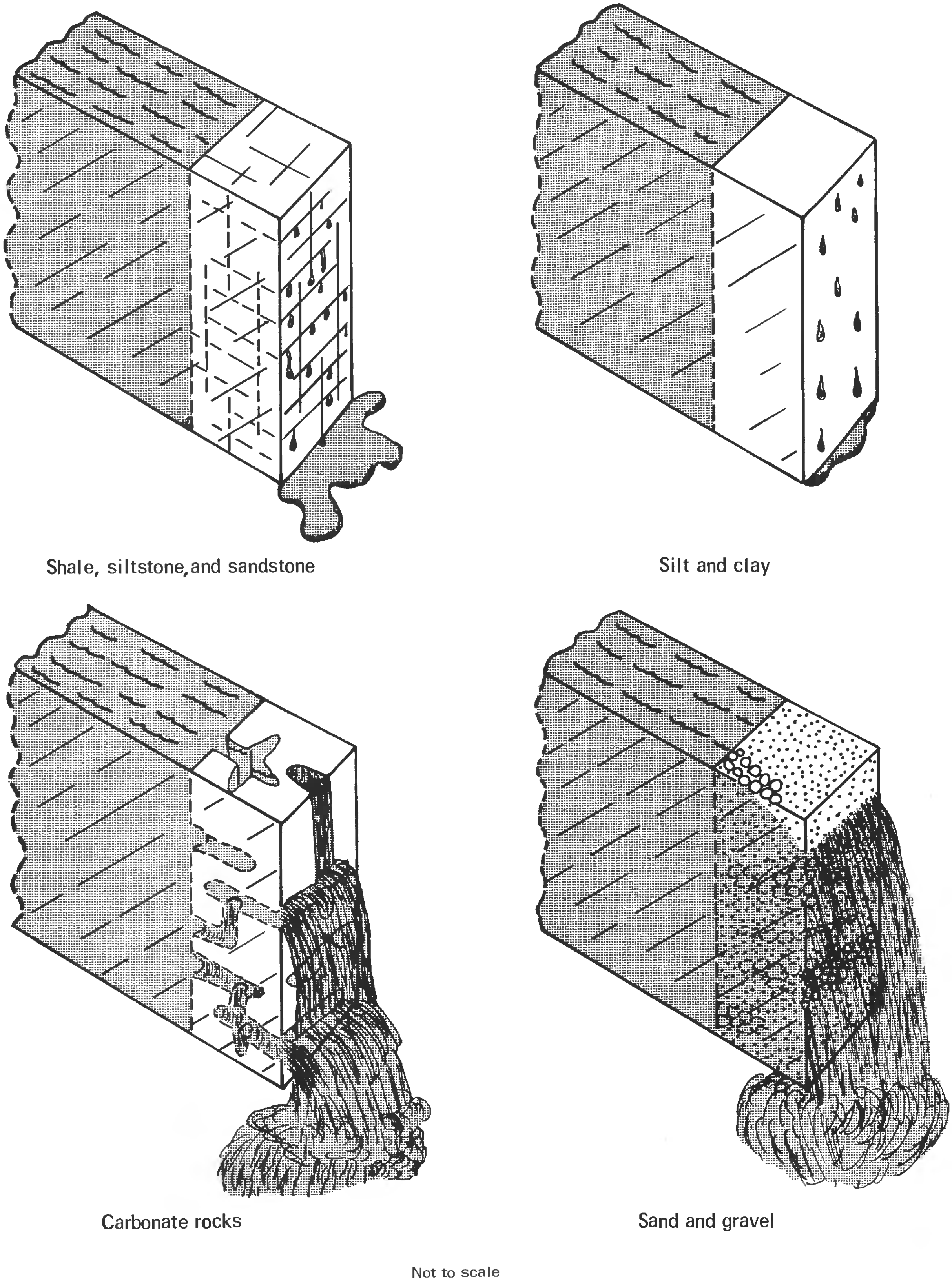


Figure 11.--Relative permeabilities of some different types of bedrock and unconsolidated deposits in the Western Oswego River basin.

A quantitative value for permeability allows the amount of ground water moving through a material to be computed by the application of Darcy's law, which may be expressed as:

$$Q = PIA$$

were $\underline{Q}$ is the quantity of water discharged in gallons per day, $\underline{P}$ is the permeability in gallons per day per square foot, $\underline{I}$ is the hydraulic gradient in feet per foot, and $\underline{A}$ is the cross-sectional area through which the water moves. This formula serves as the basic tool for detemining the amount of water moving into, or available from, ground-water reservoirs.

As Aquifers

Any water-bearing deposit that will yield water in usable quantities is called an "aquifer." This, of course, includes almost all bedrock and unconsolidated deposits in the Western Oswego River basin. However, aquifers range from poor to excellent, in terms of the quantities of water that they can provide. Obviously, an aquifer that will supply 100 gpd to a well may be adequate for a homeowner but will not be acceptable to an industry requiring 1,000,000 gpd.

Aquifers may contain water under "water-table" or "artesian" (confined) conditions. Water-table aquifers are the most common in the basin. In these aquifers, the zone of saturation is recharged directly by infiltration from above; and the water table, or surface of the saturated zone, is free to rise and fall in response to changes in water storage.

Some aquifers are partly overlain by impermeable material such as silt or clay, which is said to "confine" the water that moves through these aquifers. As water reaches the water table in unconfined parts of such an aquifer, its weight creates a pressure that is transmitted by the water through the aquifer and against the bottom of the confining bed. As a result, when a well is drilled through the confining bed, water rises above the top of the aquifer and the well is said to be artesian. If the pressure in a confined aquifer is great enough, the water may flow from a well. (Heads as much as 42 feet above land surface were recorded in the area during this study.)

Aquifers under water table and artesian conditions are illustrated in figure 12. In the block showing the water-table aquifer, the aquifer is in hydraulic contact with the stream; and the water level in the well reflects the altitude of the water table. In the block showing the confined or artesian aquifer, the aquifer is not in hydraulic contact with the stream; and the water level in a well tapping the deposit rises to an elevation equal to the pressure exerted on the water by the head in the recharge area (where the aquifer is under water-table conditions) minus some head loss due to friction. This imaginary surface to which water in a confined aquifer will rise, is termed a "potentiometric surface."

The pressure surface in an artesian aquifer fluctuates over the year just as the water table in an unconfined system does. Unlike the unconfined aquifer, these fluctuations are caused by pressure changes and do not result in significant storage changes in the artesian aquifer. Bedrock, as shown in figure 12, can be confined or unconfined, depending on the local geologic conditions. Also, the bedrock can be the most important aquifer underlying one locality and relatively unimportant in areas nearby.

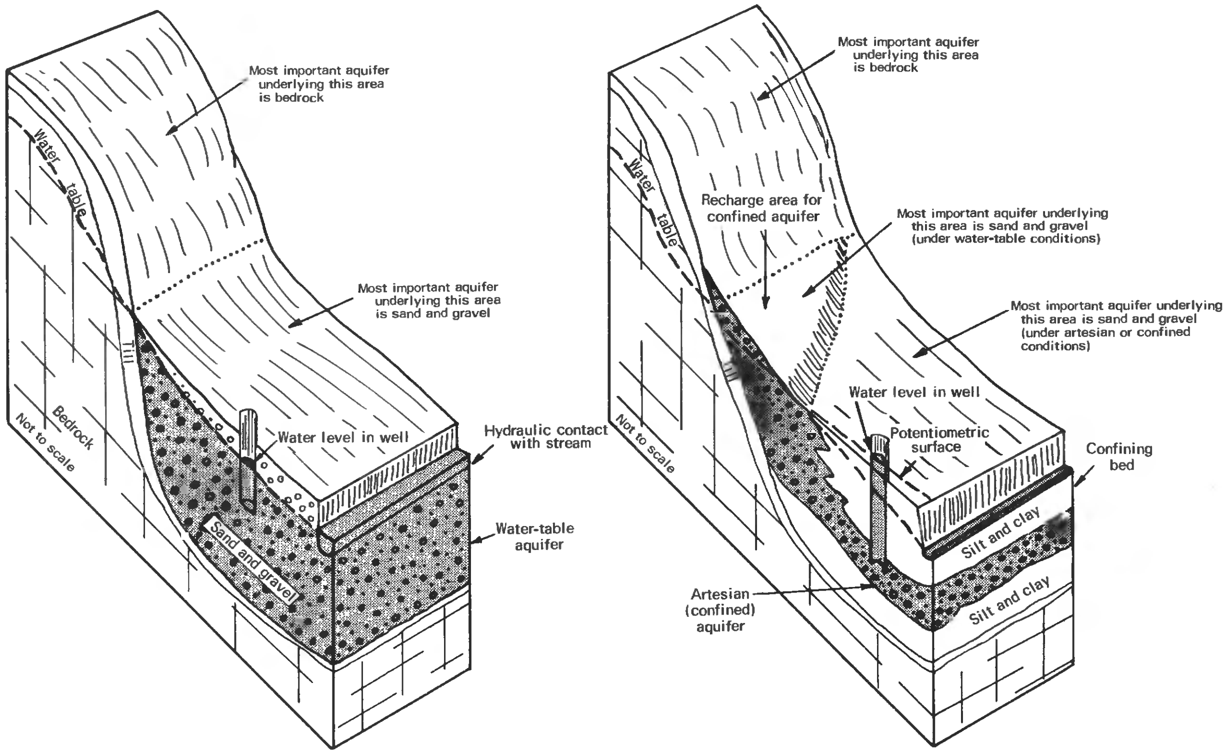


Figure 12.--Occurrence of water under water-table and artesian conditions.

Hydrologic Cycle and Geologic Influence

The ultimate source of all water in the Western Oswego River basin is precipitation. As precipitation falls on the area, some of it flows over the land surface, some is evaporated or transpired back to the atmosphere, and some infiltrates into the ground (fig. 13). The overland flow reaches streams and is discharged from the area. Of the water that infiltrates into the ground, some is retained in the soil and unsaturated material, or the "zone of aeration"; and some percolates downward to the "zone of saturation", in which all the pores and fracture openings are filled with water. The surface of the zone of saturation is the water table, except where the zone is overlain by impermeable material and the ground water is confined. The water in the zone of saturation moves under the influence of gravity to points of discharge such as streams, lakes, or swamps.

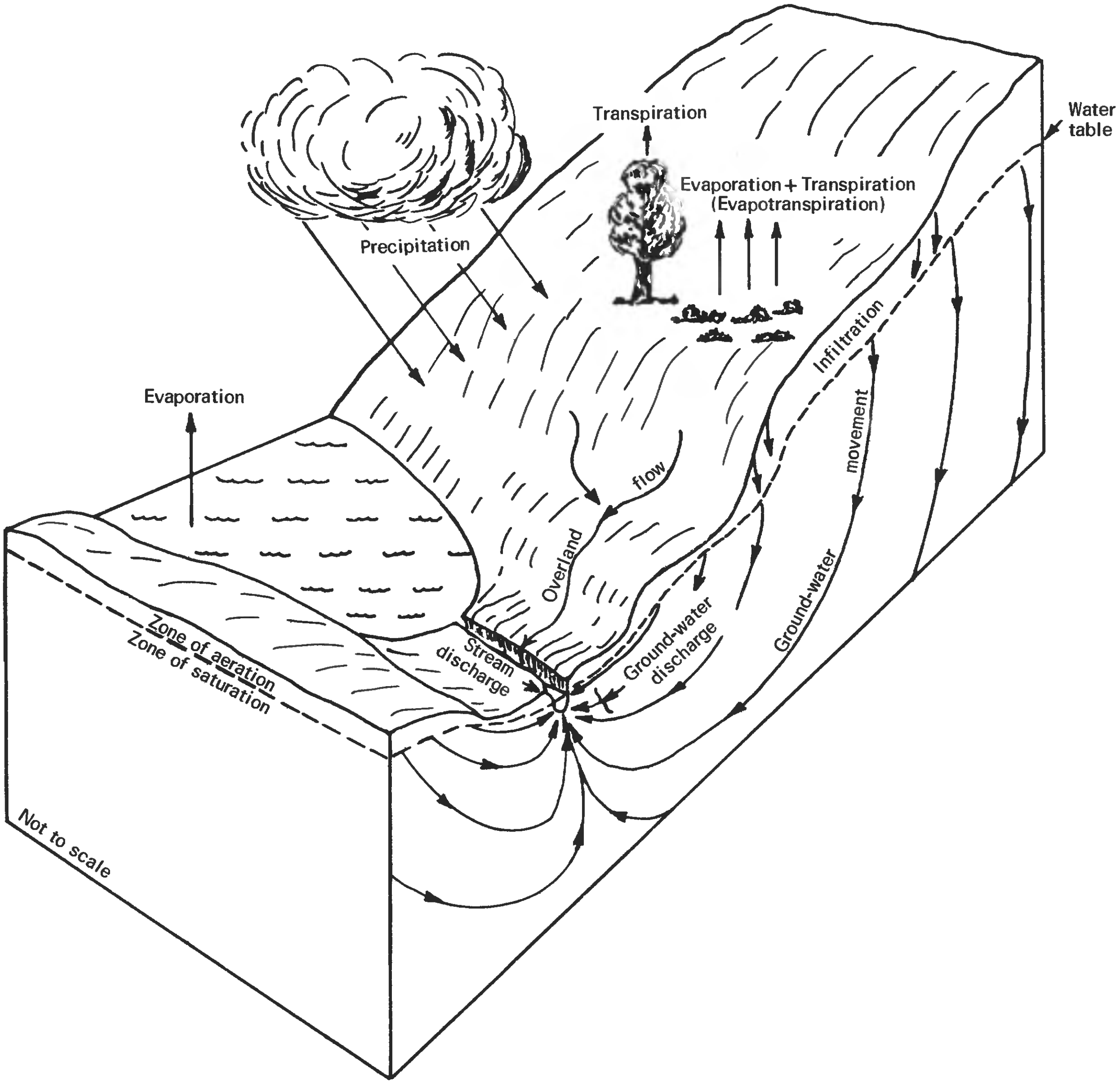


Figure 13.--Hydrologic cycle.

Stream discharge from the basin represents water not returned to the atmosphere by evaporation and plant transpiration, which are collectively termed "evapotranspiration." In the Western Oswego River basin, approximately one-half to two-thirds of the yearly precipitation is returned to the atmosphere as evapotranspiration. The rate of evapotranspiration is variable during the year and from year to year and is directly related to factors such as precipitation, temperature, sunlight, amount of wind, and plant growth. During the winter months, little precipitation is lost through evaporation; and virtually none by transpiration. During the spring, evapotranspiration increases; but a sizable water surplus exists because snowmelt and precipitation more than balance the water loss. During the summer, evapotranspiration is at its peak and usually exceeds the precipitation rate. At this time plants withdraw water that has accumulated in the soil zone as a result of the water surplus of the previous spring. With a return to low temperatures in the fall, the evapotranspiration rate falls below the precipitation rate and the soil water is replenished.

The amounts of water involved in the different phases of the hydrologic cycle change from year to year because precipitation and temperatures differ each year. An accounting of the amount of water that enters the basin as precipitation, the amount that leaves the basin as evapotranspiration or stream discharge, and changes in the amount stored within the basin, either as surface or ground water, is called the "water budget."

Runoff and Infiltration

Surficial geology is probably the most important geologic factor in determining the amount of precipitation that can infiltrate to the water table. As shown in figure 14, the amounts of water reaching the water table can differ greatly in two hypothetical sections of the basin that are identical except for surficial geology.

Although the same amount of precipitation falls on each block in figure 14 and the amounts of water lost through evapotranspiration are equal, the block with the more permeable surficial material (sand and gravel) allows the greater volume of water to infiltrate and reach the water table. This water is called recharge. The less permeable material (till) prevents rapid infiltration, and most water runs off over the land surface and is discharged quickly through streams.

Factors that may modify the effect of the surficial geology on infiltration in any given area include: (1) intensity and amount of precipitation, (2) slope of the land surface, and (3) season of the year. For example, the fast rate of runoff during a very heavy rainfall does not allow the water as much time to enter the ground as during a gentle rain. Also, runoff is more rapid on steep slopes where there is less time for infiltration, than on flat areas. As previously mentioned, during the summer much water is lost to evaporation or is trapped in the soil zone and transpired by plants before it can percolate beyond the root zone to the water table. Also, during the winter months when the amount of surplus water is large, the ground may be frozen. This prevents infiltration and again causes water to be lost as runoff.

Storage and Movement

As soon as water reaches the zone of saturation, it begins to move toward areas of discharge. The ground-water system is a dynamic one, and gravity is the dominant propelling force as water moves from areas of high head to areas of lower head. Generalized flow paths of ground-water movement are shown in figure 13. The curved lines emphasize that the water is moving in response to pressure (head), as well as to gravity, through a system of pores and rock fractures. Picturing the flow paths helps in understanding why water always moves downward when it infiltrates into the land surface, yet may move upward at points of discharge such as springs and streams. Of course, the flow paths shown in figure 13 are very general, and in actual cases they can either be "short-circuited" by more permeable materials through which the water flows more easily or be deflected by impermeable materials. Several systems may also be superimposed on one another. For example, small flow systems in the Finger Lakes area contribute to tributary

streams in the uplands and overlie a larger flow system that discharges into the lakes. More detailed discussions of ground-water movement may be found in papers by Hubbert (1940) and Toth (1962).

Because the ground-water system is a dynamic one, the amount of water stored in the zone of saturation varies with the rates of ground-water recharge and discharge. Increases and decreases in storage are reflected by rises and declines in the water table and in water levels of wells. During winter and spring, when the evapotranspiration rate is low, rate of recharge to the zone of saturation exceeds discharge and the water table rises. During summer, discharge from the zone of saturation exceeds recharge and the water table declines.

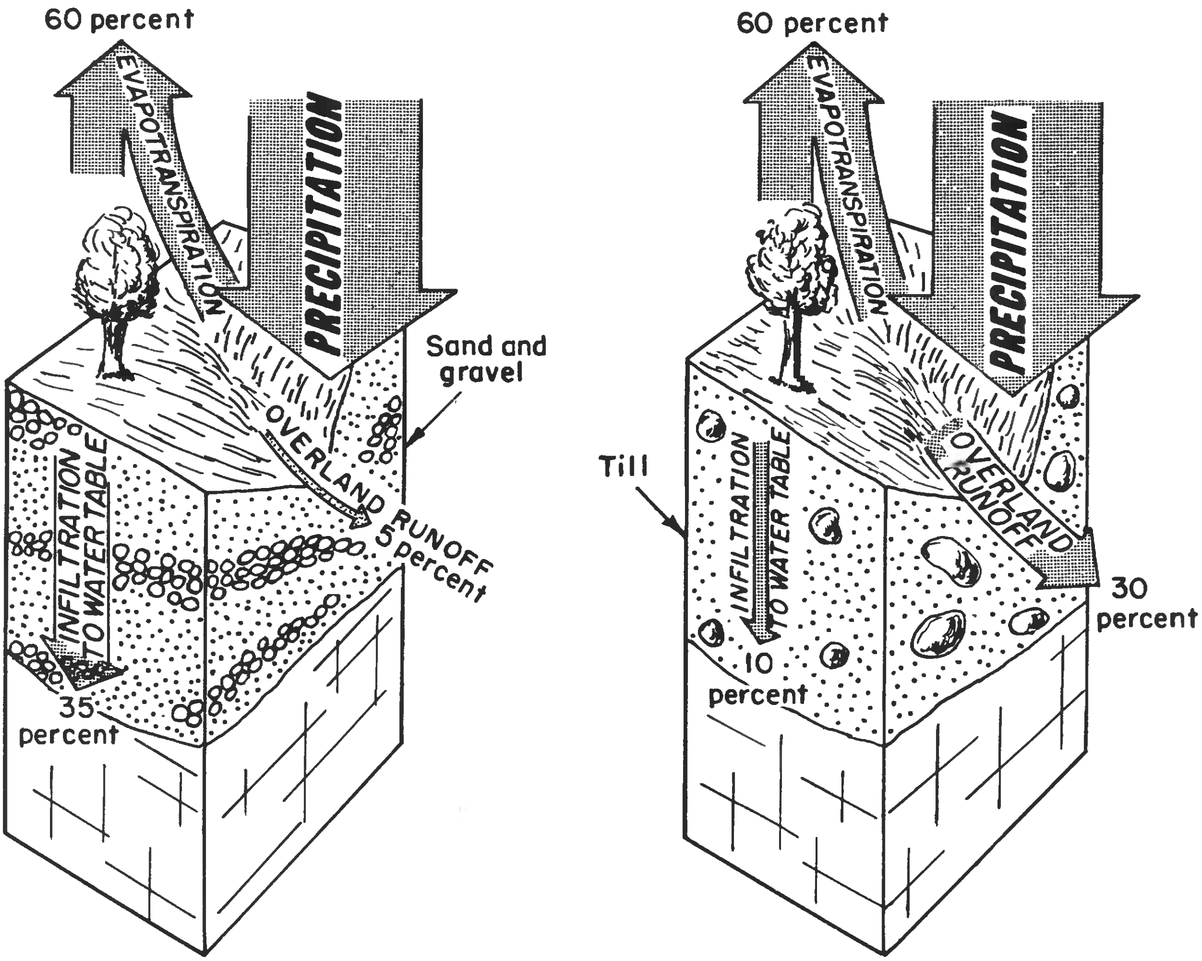


Figure 14.--Effect of surficial geology on quantity of water infiltrating to the water table.

Increases and decreases of ground-water storage, in response to recharge, evapotranspiration, and ground-water discharge, may be observed in water wells. The record of the water level in a well about 5 miles north of Canandaigua is shown in figure 15. This is the only well with a long period of record in the Western Oswego River basin. The water level in the well rises and falls each year. This seasonal variation of the water level in the well reflects the availability of water for recharge after the demands of evapotranspiration have been met. Very seldom does enough rain fall in the warm summer months to affect the water level, whereas precipitation in the cooler months often produces substantial recharge to the zone of saturation. The water level in the well is above land surface because the well taps an aquifer that is under artesian or confined conditions. However, this does not affect the well's usefulness as an indicator of water-level fluctuations. (See preceding discussion of aquifers.)

Another aspect of the water-level fluctuations shown in figure 15 is that they indicate no long-term rise or decline in ground-water levels at the site of the well. This is true of the Western Oswego River basin as a whole. Even though there may be individual years when water levels are much higher or lower than average, no trend has been established. In fact, the yearly high- and low-water levels fall within very narrow ranges. Many of the misconceptions about the often misused term "declining water table" arise from the fact that, during many recent droughts, precipitation has been below normal for many months and the water table has fallen to very low levels. The common belief is that all the precipitation deficit must be made up by increased rainfall in order to bring the water table back to normal levels. However, most of the precipitation deficit occurs in the summer months when the water would have been used for evapotranspiration and would never have reached the water table anyway. Also, only part of the yearly precipitation is needed to restore ground-water levels. Therefore, as shown in figure 15, even if ground-water levels are not fully restored in any given year, they are certain to be restored in a subsequent year.

In some areas in the Western Oswego River basin, withdrawal of water through wells has artifically depressed the ground-water levels. This has happened in only a few areas where pumpage is great and exceeds the natural recharge that is locally available. However, if ground-water withdrawals were stopped in these areas, the water levels would soon recover; and a surplus of ground water in storage would again be available for discharge.

The amount of ground-water discharge and recharge to and from the zone of saturation during a year is roughly equal, as shown by the water-level fluctuations in figure 15. However, such water-level fluctuations do not show the quantity of water being recharged or discharged. For example, a deposit of sand and gravel containing about 30 percent of its volume as water might release almost all this water if allowed to drain freely. On the other hand, a till deposit containing the same volume of water might release only 5 or 10 percent of the water if allowed to drain freely. Only a small percentage would drain because much of the water is held by capillary action in the small pore spaces in the till. Therefore, fluctuations of the water table in a permeable deposit may represent several times the volume of water that the same fluctuation would represent in a relatively impermeable deposit.

The amounts of water discharged from storage in the zone of saturation play an important role in maintaining streamflow during dry periods. A stream draining a permeable material, such as sand and gravel, would receive large quantities of ground-water discharge throughout the year and would probably flow perennially. However, if the stream were draining materials of low permeability, such as till and bedrock, the amounts of water released from ground-water storage would be relatively small. In fact, the amount of ground-water discharge during the summer might be insufficient to overcome evapotranspiration losses and the stream would dry up. Most of the perennial streams in the Western Oswego River basin are in areas underlain by sand and gravel deposits, whereas most of the streams that are dry for part of the year are in areas underlain by till and bedrock.

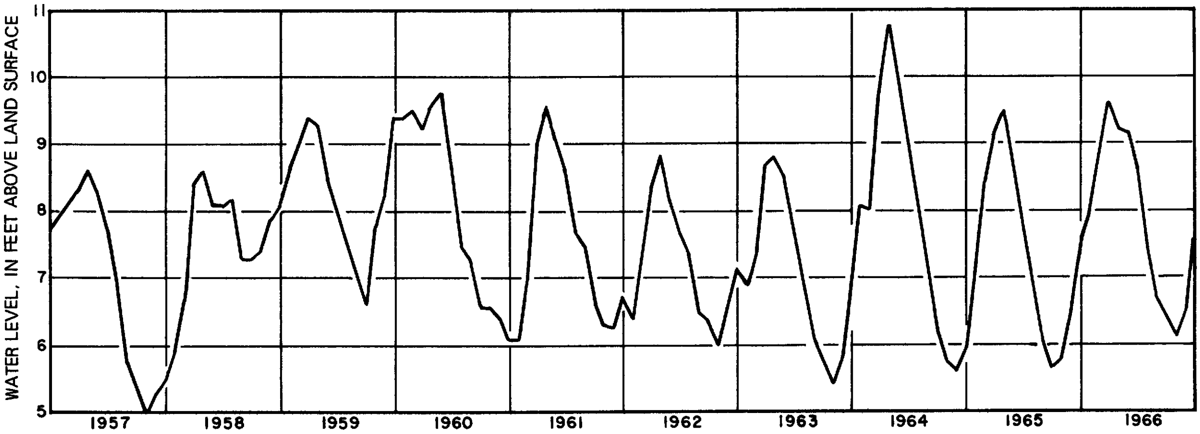


Figure 15.--Fluctuation of water level in well 425840N0771339.1

GROUND-WATER HYDROLOGY

The subjects ground-water occurrence, relation of ground water to the hydrologic cycle, and geologic controls on ground-water storage and movement have been discussed in previous sections of this report. But to provide useful information for planning the development of the ground-water resources of the Western Oswego River basin, it is necessary to define the actual quantities of water that are recharged to, and discharged from, the various ground-water reservoirs and especially to define the amounts of water that can be withdrawn from the different ground-water reservoirs on a perennial basis.

Recharge of Ground Water

The amount of ground-water recharge at any given locality is dependent primarily on two factors: (1) amount and distribution of water available for recharge, and (2) rate of infiltration through the surficial deposits.

Amount of Water Available

As previously discussed, the amount of water available for ground-water recharge is that surplus left when the demands of evapotranspiration are subtracted from the precipitation. Because there are large variations, both annually and seasonally, in the amounts of precipitation and evapotranspiration in the Western Oswego River basin, the amount of water available for recharge also varies.

Precipitation

Records of precipitation have been collected for several years at certain stations in the Western Oswego River basin. Annual mean, lowest, and highest precipitation of seven of these stations are shown in table 2, and locations are plotted in figure 16. These values are based on the period 1931-64, except for the station at Canandaigua, which has a shorter period of record (Dethier, 1966).

The mean annual precipitation figures for most of the stations are all within a few inches of one another, but the range between the lowest and the highest annual precipitation at any one station may be 20 inches or more (table 2). However, variation from the mean annual precipitation at any single station is usually on the order of 10 inches or less.

Figure 16 is a map of the average annual precipitation in the Western Oswego River basin. The precipitation lines on the map are modified after Dethier (1966) and Knox and Nordenson (1955). Average annual precipitation ranges from about 32 inches per year in the northwest corner of the basin to more than 40 inches per year in the southeast corner. Precipitation also increases with altitude and is probably even greater than 40 inches at some of the higher altitudes in the southeast; but the data on which the map is based are not sufficient to show such detail. The precipitation lines were adjusted slightly to reflect this change with altitude.

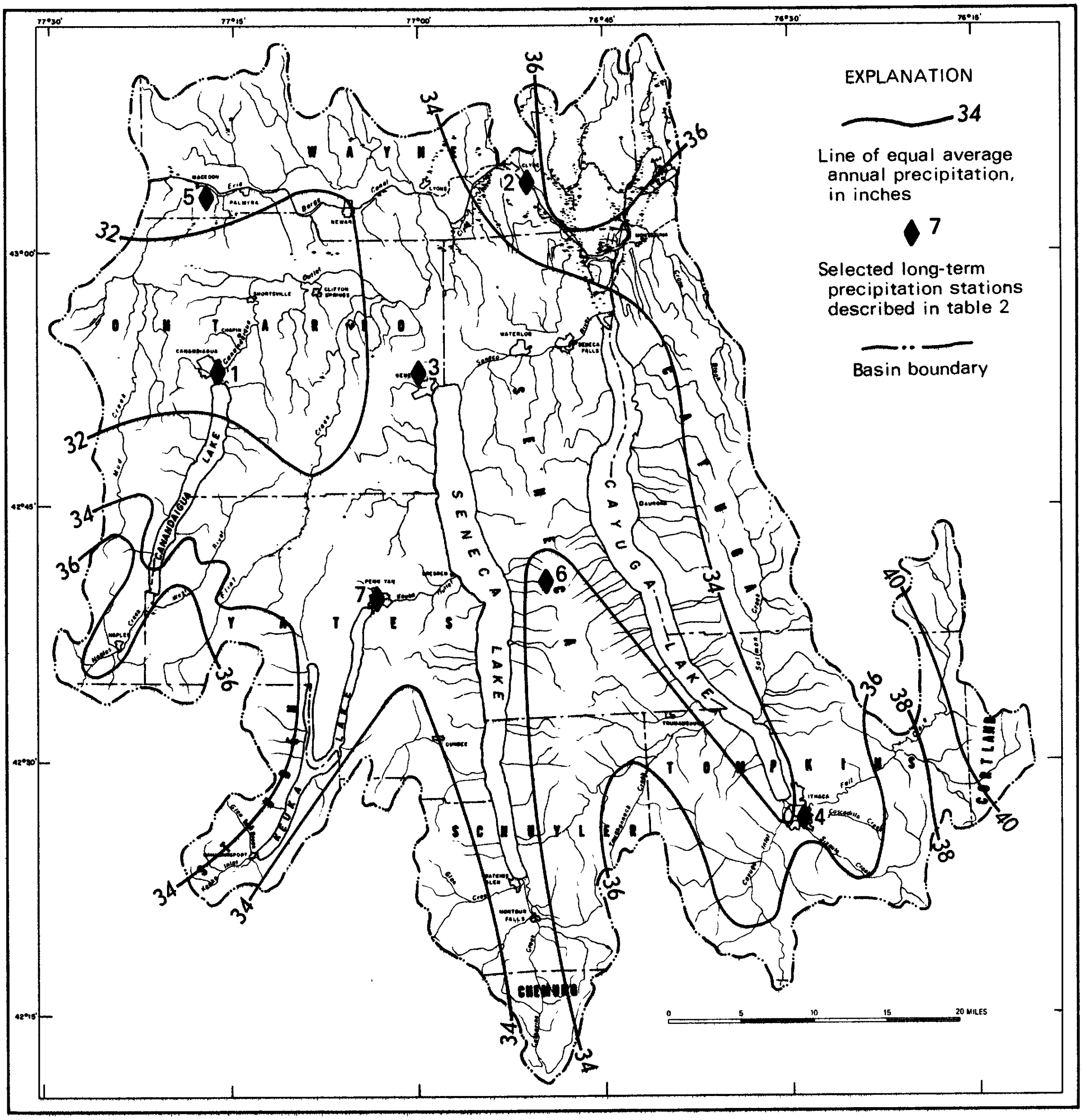


Figure 16.--Average annual precipitation in the Western Oswego River basin.

Table 2.--Mean, lowest, and highest annual precipitation for seven selected stations in the Western Oswego River basin (after Dethier, 1966)

Station	Annual precipitation (in inches)		
	Mean	Lowest	Highest
1. Canandaigua (3 miles south)	29.34	21.99	40.13
2. Clyde (Lock 26)	36.22	25.04	47.02
3. Geneva (Experimental Station)	32.60	22.81	40.41
4. Ithaca (Cornell University)	34.32	27.96	46.56
5. Macedon	32.04	22.30	42.82
6. Ovid	33.91	26.04	44.95
7. Penn Yan (2 miles southwest)	31.47	23.57	41.17

Evapotranspiration

The amount of precipitation lost to evapotranspiration in the Western Oswego River basin was estimated by direct computations and by examination of streamflow records. The direct computation method used in this report was developed by Thornthwaite (1948) and takes into account factors such as air temperature, precipitation, duration of sunlight, and soil moisture. This method is useful because it allows the determination of evapotranspiration on a monthly or even daily basis. However, the method contains certain inherent errors because values for some of the parameters (such as soil moisture) can only be estimated. Also, the evapotranspiration values are correct only for the site where the data used in the computations were collected, and evapotranspiration may vary considerably only a short distance away.

Air temperature, precipitation, potential evapotranspiration, actual evapotranspiration, available soil moisture, and surplus precipitation (precipitation in excess of that used for evapotranspiration) at each of four stations are compared in table 3. These stations were selected because they provide fairly good coverage of the basin and have long records of precipitation and temperature. All climatological data used in the computations were taken from reports by Dethier (1966), and Dethier and Pack (1965a, 1965b), and from the records of the U.S. Weather Bureau. An available soil-moisture storage figure of 4 inches was used.

Table 3.--Precipitation, evapotranspiration, and water surplus for four stations in the Western Oswego River basin

(Station numbers in parentheses correspond to location numbers in figure 16.)

Station		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Geneva (3) (Altitude 590 ft)	T°F	26	26	34	46	58	67	72	70	63	52	41	29	49
	P	2.2	2.4	2.9	2.9	3.1	3.2	3.1	2.7	2.5	2.9	2.5	2.3	32.7
	PE	0	0	.2	1.4	3.2	4.6	5.8	5.0	3.2	1.8	.6	0	25.8
	AE	0	0	.2	1.4	3.2	4.6	5.6	2.7	2.5	1.8	.6	0	22.6
	SM	4.0	4.0	4.0	4.0	3.9	2.5	0	0	0	1.1	3.0	4.0	
	SP	2.2	2.4	2.7	1.5	0	0	0	0	0	0	0	1.3	10.1
Canandaigua (1) (Altitude 720 ft)	T°F	25	26	34	46	56	66	71	70	63	53	41	29	48
	P	1.8	2.0	2.4	2.9	3.3	2.8	2.7	2.5	2.2	2.8	2.4	1.7	29.5
	PE	0	0	.1	1.5	3.0	4.4	5.4	4.8	3.3	2.1	.6	0	25.2
	AE	0	0	.1	1.5	3.0	4.4	5.1	2.5	2.2	2.1	.6	0	21.5
	SM	4.0	4.0	4.0	4.0	4.0	2.4	0	0	0	.7	2.5	4.0	
	SP	1.8	2.0	2.3	1.4	.3	0	0	0	0	0	0	.2	8.0
Penn Yan (7) (Altitude 720 ft)	T°F	25	26	34	46	57	67	72	69	63	52	40	29	48
	P	2.0	1.9	2.7	2.9	3.2	3.0	3.5	3.0	2.2	2.8	2.4	1.9	31.5
	PE	0	0	.1	1.3	3.1	4.7	5.8	5.0	3.3	1.4	.5	0	25.2
	AE	0	0	.1	1.3	3.1	4.7	5.8	3.0	2.2	1.4	.5	0	22.1
	SM	4.0	4.0	4.0	4.0	4.0	2.3	0	0	0	1.4	3.3	4.0	
	SP	2.0	1.9	2.6	1.6	.1	0	0	0	0	0	0	1.2	9.4
Ithaca (4) (Altitude 950 ft)	T°F	24	25	33	45	55	65	69	68	61	51	39	27	47
	P	2.0	2.0	2.8	2.9	3.4	3.4	3.6	3.6	2.9	2.9	2.6	2.3	34.4
	PE	0	0	.1	1.5	3.0	4.4	5.5	4.8	3.1	1.8	.5	0	24.7
	AE	0	0	.1	1.5	3.0	4.4	5.5	4.7	2.9	1.8	.5	0	24.4
	SM	4.0	4.0	4.0	4.0	4.0	3.0	1.1	0	0	1.1	3.2	4.0	
	SP	2.0	2.0	2.7	1.4	.4	0	0	0	0	0	0	1.5	10.0

EXPLANATION

T°F - Mean air temperature, in degrees Fahrenheit (long-term average).

P - Mean precipitation, in inches (long-term average).

PE - Mean potential evapotranspiration, in inches (computed).

AE - Mean actual evapotranspiration, in inches (computed).

SM - Available soil moisture, in inches.

SP - Mean water surplus (surplus precipitation), in inches (computed).

Potential evapotranspiration may be defined as the amount of water that will be lost through evapotranspiration if sufficient water is available at all times from precipitation and soil moisture storage to supply the demand. The annual potential evapotranspiration at each of the stations varies directly with the mean annual air temperature. A plot of mean annual air temperature against potential evapotranspiration shows that the annual evapotranspiration increases about 1 inch for every 2°F (Fahrenheit) increase in mean annual air temperature. Potential evapotranspiration can also be related to altitude because temperature varies with altitude. A plot of the mean annual air temperature against the altitude of the different stations shows that the mean annual temperature varies inversely with the altitude, and, therefore, the potential evapotranspiration rate would also decrease with a rise in altitude. An extended plot of temperature against altitude indicates that the mean annual air temperature ranges from about 44°F at the 2,000 foot altitude in the southern part of the basin to about 50°F at the lowest part of the basin in the north.

An examination of table 3 shows that the computed values for the actual evapotranspiration do not correspond with the potential evapotranspiration. The two computed values differ because the actual amount of water lost through evapotranspiration can only equal the amount available, either from precipitation or from withdrawal from soil moisture storage. Because less precipitation is generally available at those stations at lower altitudes, the amount of water available for evapotranspiration is also less. Therefore, especially at lower altitudes, the demands of evapotranspiration are not met during the summer months; and the actual water loss is lower than the potential.

An analysis of table 3 and the general relationships between precipitation, air temperature, and potential evapotranspiration established the following:

(1) The mean annual evapotranspiration in the areas of the basin below an altitude of about 900 feet ranges from about 21 to 23 inches.

(2) The highest mean water loss to evapotranspiration of about 24 to 25 inches occurs at an altitude of about 950 feet, where the amount of precipitation is sufficient to supply the potential evapotranspiration during the summer.

(3) At an altitude of about 2,000 feet (not represented in table 3), enough precipitation is available to meet the evapotranspiration demands; but average annual evapotranspiration is only about 20 inches because temperature and therefore potential evapotranspiration decrease with increasing altitude.

The other method that was used in determining evapotranspiration is the examination of streamflow records. A stream-gaging station in the drainage basin, if it is at a point that is not bypassed by significant quantities of water, provides a measurement of the surplus precipitation (runoff) that is discharged from the basin. By substracting the quantity of streamflow from the quantity of precipitation over the basin, one can compute the amount of evapotranspiration (water loss) from the basin.

The difficulty with using streamflow to determine evapotranspiration is that for short periods of time the flow is influenced by antecedent factors such as water storage in the stream, delay time between ground-water recharge and discharge, and storage of precipitation on the land surface (snow and ice). Such factors make it impossible to use streamflow to determine evapotranspiration over short-term periods although the determination can be done relatively accurately on an annual basis. Stream-gaging stations with fairly long periods of record provide the most accurate values for use in determining average annual evapotranspiration. The best 12-month periods of record to examine are the so-called "water years," which run from October 1 to September 30 of the following calendar year. The water year makes computations easier by beginning and ending when streamflow and ground-water storage are usually at their lowest and most stable positions and when most of the surplus precipitation accumulated during the winter and spring has been discharged from the basin. The total streamflow for this 12-month period, when subtracted from the total precipitation, approximates the total evapotranspiration.

As has been shown, streamflow records provide a fairly accurate method of determining annual evapotranspiration; and the computed values (table 3) provide a method of distributing the evapotranspiration throughout the year. A comparison of the yearly values computed by the Thornthwaite method with those determined by streamflow is of practical interest. Where there is close agreement between the two sets of yearly data, computed monthly data may be assumed to be fairly accurate.

However, evapotranspiration is determined only because it represents the water that is lost from the basin and is not available for ground-water recharge. The important factor in the analysis of ground-water recharge is the water surplus (precipitation minus evapotranspiration) that might be available for recharge. Therefore, any evaluation of the two methods would be more accurate, direct, and meaningful if done with the available water-surplus values.

Water surplus

The water surplus, or amount of excess water left after the demands of evapotranspiration are met, is the water available for ground-water recharge. The annual surplus represents the maximum quantity available, and the manner in which this surplus is distributed for recharge throughout the year controls the maximum amount that man can ultimately utilize.

Annual surplus.--The computed water surplus (surplus precipitation) at each of four stations in the basin is shown in table 3. Note that the mean annual water surplus ranges only from 8.0 inches at Canandaigua to 10.1 inches at Geneva.

To check computed values against values determined from measurements of streamflow, two periods of climatic record at Ithaca were matched against streamflow records of Cayuga Inlet near Ithaca. This stream was selected because the streamflow records are considered accurate and the drainage basin is near a station with long-term weather records.

Computed values for evapotranspiration and water surplus for one exceptionally dry period (October 1964 through September 1965) and one exceptionally wet period (October 1957 through September 1958) at Ithaca are shown in table 4. Also shown is the measured water surplus (streamflow) during these periods at the gaging station on Cayuga Inlet. The computed surplus for the dry period is 6.3 inches, and the measured surplus is 5.7 inches (U.S. Geol. Survey, 1965). During the wet period the computed surplus was 16.8 inches, and the measured surplus was 17.3 inches (U.S. Geol. Survey, 1964). The close agreement of the data shows that the method of computing the evapotranspiration rates and water surpluses is valid enough to be useful.

The relationships that have been established between air temperature, altitude, evapotranspiration, and precipitation at several stations in the basin provide the means for determining water surpluses for the entire basin. Mean annual water surplus in the Western Oswego River basin is shown in figure 17. This surplus ranges from about 8 inches in the northern part of the basin to about 20 inches at higher altitudes in the southern part of the basin.

Table 4.--Precipitation, evapotranspiration, and water surplus at Ithaca, N.Y., during one wet period and one dry period

		Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
1957-58 (Wet Period)	T°F	49	41	18	22	20	31	46	58	66	70	72	65	46
	P	2.1	1.5	3.1	4.9	3.9	3.0	4.1	3.4	6.3	5.1	4.4	4.7	46.5
	PE	1.5	.6	0	0	0	0	1.5	3.3	4.6	5.4	5.4	3.5	25.8
	AE	1.5	.6	0	0	0	0	1.5	3.3	4.6	5.4	5.4	3.5	25.8
	SP	0	0	.6	4.9	3.9	3.0	2.6	.1	1.7	0	0	0	16.8
	Measured surplus (stream discharge of Cayuga Inlet) -- 17.3 inches													
1964-65 (Dry Period)	T°F	47	42	28	20	24	30	40	59	62	66	67	62	46
	P	1.0	1.4	3.2	2.2	1.3	1.8	2.1	1.5	2.8	2.2	2.8	2.8	25.1
	PE	1.4	.8	0	0	0	0	.9	3.5	4.2	4.6	4.5	3.3	23.2
	AE	1.0	.8	0	0	0	0	.9	3.5	4.2	2.8	2.8	2.8	18.8
	SP	0	0	0	2.0	1.3	1.8	1.2	0	0	0	0	0	6.3
	Measured surplus (stream discharge of Cayuga Inlet) -- 5.7 inches													

EXPLANATION

T°F - Mean air temperature, in degrees Fahrenheit.

P - Precipitation, in inches.

PE - Potential evapotranspiration, in inches (computed).

AE - Actual evapotranspiration, in inches (computed).

SP - Water surplus (surplus precipitation), in inches (computed).

A comparison of these surpluses with the average annual discharges at basin gaging stations that have fairly lengthy records shows good agreement. The mean annual runoff at four gaging stations in the basin also is shown in figure 17. The agreement may not seem good at first glance, but an examination of the drainage areas of the individual streams shows that their headwaters are in regions of high water surplus and that the measured flows represent excellent integrated values for the various regions.

<u>Seasonal distribution</u>.--As shown in the water budget computations in table 3, on the average, more than 95 percent of the water surplus occurs in the 5 months December through April. Only in exceptionally wet years

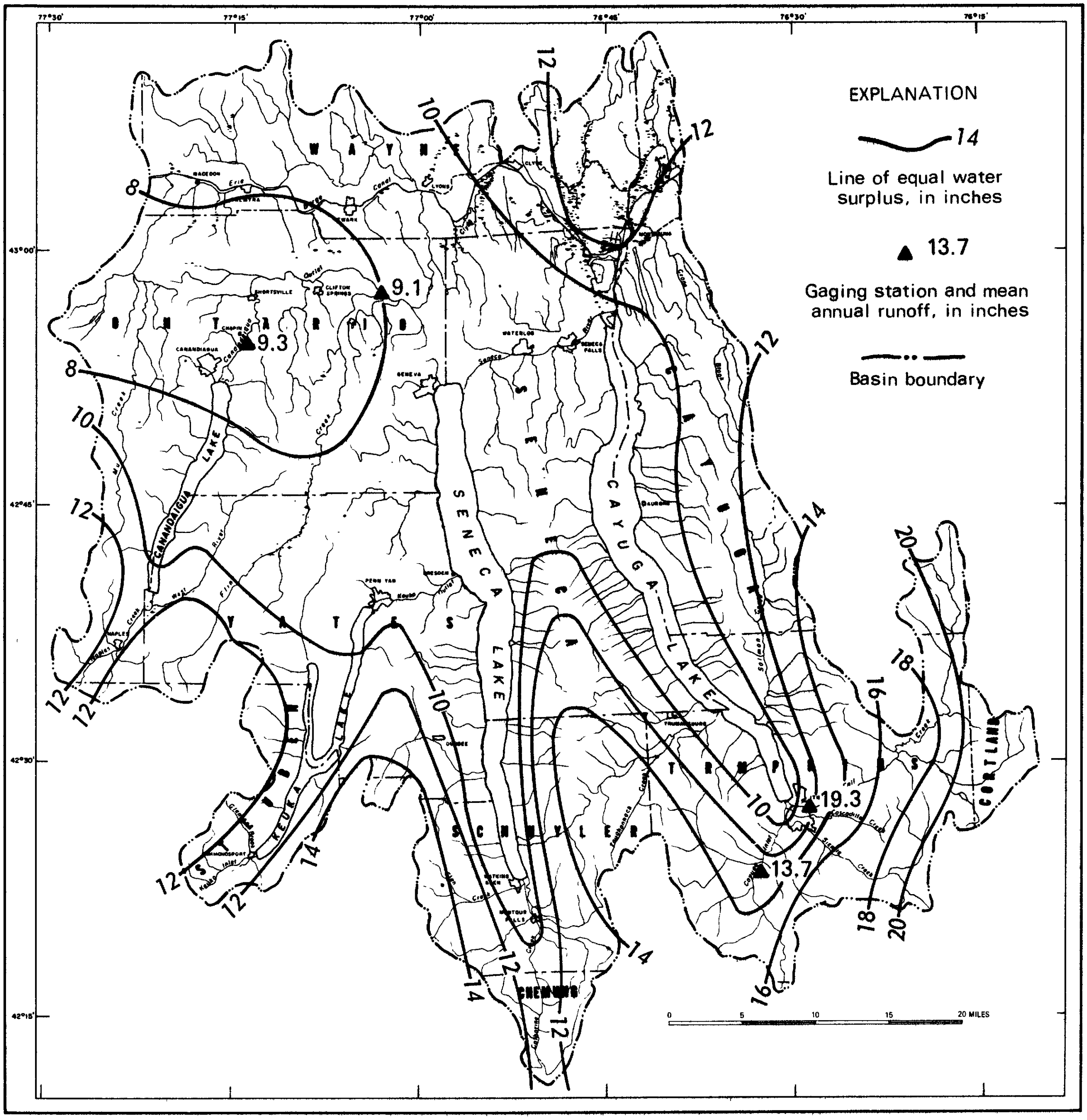


Figure 17.--Average annual water surplus in the Western Oswego River basin.

does any water surplus occur during the summer months. The percentage of the annual precipitation surplus that is recorded in each month, on the average, is shown in figure 18, which is based on the data in table 3. More than 50 percent of the water surplus occurs in the months of December, January, and February. However, most of the water surplus is in the form of ice and snow. Therefore, it is unavailable for immediate ground-water recharge. As much as half of the water surplus during these months is lost to overland runoff because the rain and melting snow are unable to enter the frozen ground. This means that 25 percent of the annual water surplus is probably lost and only 75 percent is available for eventual recharge.

By March the ground has usually thawed and the winter's accumulation of snow is melting. Therefore, a large and fairly continuous supply of water for recharge is available and is able to enter the ground; and the greatest gains in ground-water storage usually occur during March.

Water-level fluctuations in well 425314N0765548.1 and variation of precipitation at the Geneva, N.Y., weather station from October 1965 to September 1966 are shown in figure 19. The Geneva weather station is about 3 miles west of the well. Although there was substantial precipitation during October and November, it was used to replace soil moisture and did not reach the water table. By the end of December some water recharged the ground-water body, and the water level in the well rose. However, by the middle of January the water level had stabilized and had even begun to decline (owing to the frozen ground and lack of infiltration). This decline continued until the middle of February when the water level in the well began to rise rapidly. The weather records for February show that the second week of the month was characterized by temperatures well above freezing and by almost an inch of rain on February 14. This sequence of events was enough to thaw the ground and allow water to infiltrate to the water table. The rise of the water level

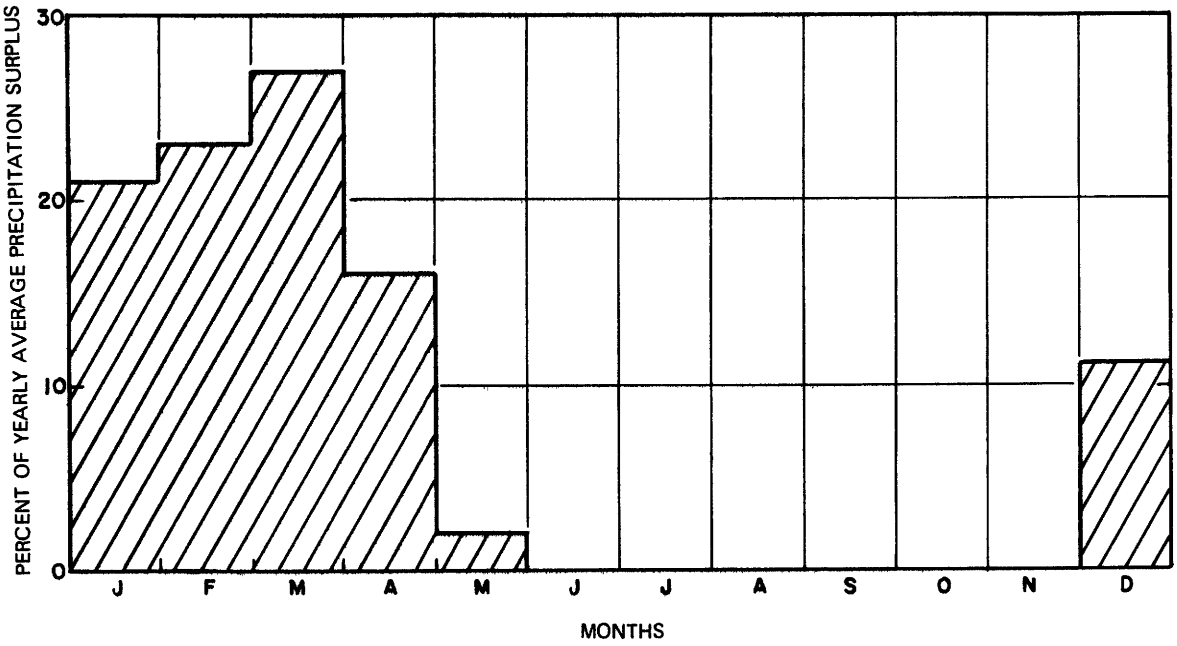


Figure 18.--Average annual precipitation surplus, by month, in the Western Oswego River basin.

in the well continued until about the end of March. At this time, a decrease in precipitation caused the water level to begin declining. Increased precipitation during the latter half of April and part of May resulted in recharge equal to the discharge from the aquifer, and the water level was virtually stablized for a short period. However, by the end of May, the increase in the rate of evapotranspiration stopped or nearly stopped infiltration so that the water level in the well resumed its decline. Even the large amounts of precipitation in June and July did not result in any significant recharge to the aquifer.

An examination of the hydrograph in figure 19 reveals that there are about 100 days during the 12-month period when the water level in the well was on a rising trend due to recharge to the aquifer. However, water was not actually infiltrating into the ground on all the days when the water level in the well was rising. The explanation for these sustained rises lies in the way water moves through unsaturated materials. As the water enters the ground it is dispersed through the pore spaces or fractures in the earth materials. Therefore, not all the water travels the same distance or at the same rate. For this reason, any water that enters the ground during a single recharge event actually reaches the water table over a period of several days. This lag time between the actual infiltration and the actual addition of the water to ground-water storage is the factor that helps to smooth out the fluctuations in the water table, so that there is a series of gradual rises and declines in the curve. Because this movement of water through the zone of aeration to the water table is directly related to the permeability and the thickness of the material overlying the aquifer, an aquifer that is at a shallow depth or is overlain by very permeable material will react to recharge much quicker and to a greater degree than will a deep aquifer or one that is overlain by less permeable material.

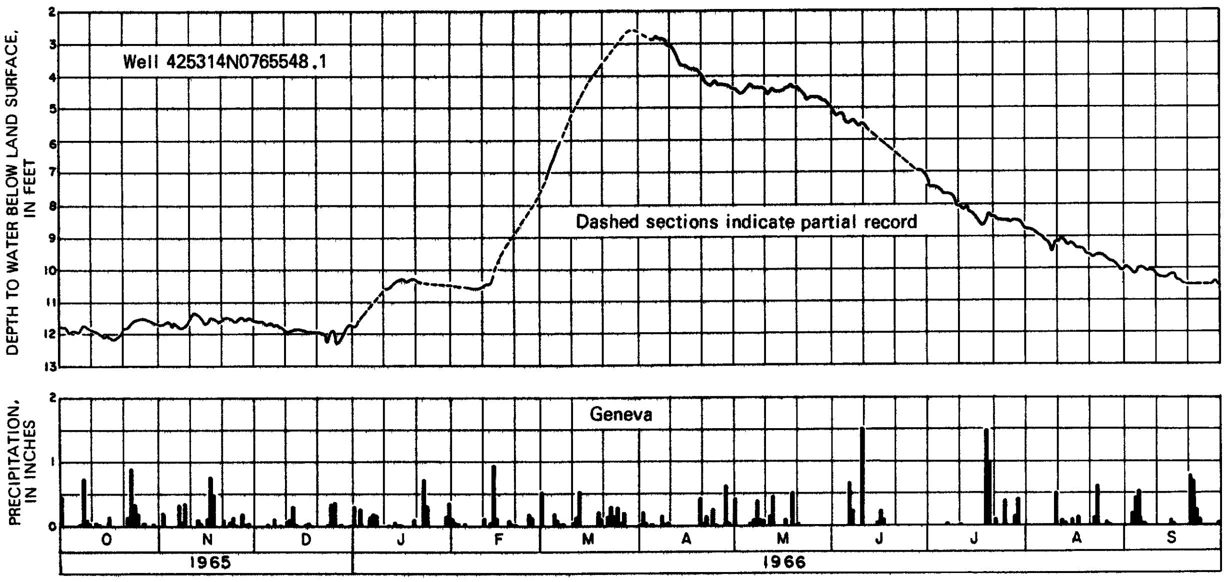


Figure 19.--Fluctuation of water level in well 425314N0765548.1 and variation of precipitation at Geneva, N.Y., from October 1965 to September 1966.

On the basis of records of water levels in the Western Oswego River basin and U.S. Weather Bureau records of rainfall, infiltration of water that ultimately becomes ground-water recharge probably occurs on about 60 days during the year. The surplus precipitation must enter the ground during this time or be lost as overland runoff. Thus, permeability of the surficial deposits becomes important in determining the actual amount that can infiltrate.

Amount of Ground-Water Recharge

The quantity of ground-water recharge in the Western Oswego River basin may be computed by using the following information determined in the preceding discussions: (1) the values from the water-surplus map (fig. 17); (2) the estimate that only about 75 percent of the water surplus is available for ground-water recharge; and (3) the estimate that infiltration takes place on about 60 days per year.

Using the water surplus map in figure 17, one can easily compute the amount of water available for recharge. Assuming that 75 percent of the water is actually available, the potential ground-water recharge in the basin ranges from about 6 inches to 15 inches per year or 105 to 262 mgy per sq mi (million gallons per year per square mile). Also, assuming that all this water must infiltrate into the ground during a total of 60 days, computations can be made to determine whether the surficial material will accept or reject all or part of this water.

Studies of a well in till south of Seneca Falls (section, "Availability of Ground Water") and previous studies in the eastern part of the State (Winslow and others, 1965, p. 26), have shown that the permeability of till is 0.01 gpd per sq ft or less. Inserting this value into the formula for ground-water flow as described by Darcy (section, "Hydraulic Character of Bedrock and Unconsolidated Deposits"), one can calculate the quantity of water moving from the land surface into the till or silt and clay in 60 days over 1 square mile of land surface as follows:

$$Q = PIA \times 60 \text{ days} \qquad \text{Where: } P = 0.01 \text{ gpd per sq ft}$$

$$= 16{,}727{,}000 \text{ gallons} \qquad I = 1 \text{ ft per ft}$$

$$A = 27{,}878{,}400 \text{ sq ft}$$

Therefore, the low permeability of till and silt and clay, will result in the rejection of all but about 17 mgy per sq mi. This value would be the same for those till and silt and clay areas over the entire basin, regardless of the water surplus available, except for the fact that the permeability of the till can vary considerably from the 0.01 gpd per sq ft used in the computations. For example, a till with a permeability just 0.01 gpd per sq ft greater would admit twice as much water. Recharge in areas of till probably ranges from less than 17 mgy per sq mi to about 40 mgy per sq mi; recharge would be greatest in some of the sandy tills in the northern part of the basin. With these factors in mind, an average figure of about 20 mgy per sq mi would seem to be of about the right magnitude to be applied to the areas of till and silt and clay throughout the basin.

A calculation of the permeability that will allow all the maximum available recharge of 262 mgy per sq mi to infiltrate into the ground during a 60-day period may also be made using Darcy's law. This permeability is about 0.2 gpd per sq mi (gallons per day per square mile). Because the permeability of the sand, and sand and gravel deposits, ranges from about 10 gpd per sq ft for the finest sand to about 100,000 gpd per sq ft for the coarsest gravel, the potential water surplus is easily able to infiltrate into these deposits. Therefore, the limiting factor governing the amount of ground-water recharge for these coarse-grained deposits is not their permeability, but the amount of water surplus available. Another factor that increases the amount of direct recharge to the coarse-grained deposits above those quantities shown in figure 17 is the addition of water that has been rejected by the less permeable till and silt and clay deposits and has moved as overland flow into the areas underlain by the coarse-grained deposits.

Because the coarse-grained deposits usually lie at lower altitudes than the till areas, many of them receive surplus water that cannot infiltrate into the till. Therefore, in addition to direct infiltration from precipitation, these deposits also receive supplemental recharge to the amount of about 110 to 240 mgy per sq mi from the adjoining till area, depending on the available water surplus. The amount of natural recharge to many coarse-grained deposits may be several times the amount of water surplus from direct precipitation. The amount of ground-water recharge to any coarse-grained deposit in the basin can be estimated by computing the area of the deposit and the area of till uplands draining on to it and then using 75 percent of the water-surplus values in figure 17.

One may be tempted to take the ground-water recharge figures, divide them by 365 days, and use the result as the maximum perennial yield of the aquifer. For example, a sand and gravel deposit in an area receiving about 200 mgy per sq mi would have a recharge rate of approximately 550,000 gpd per sq mi. Therefore, it would seem to be obvious that enough water is available for withdrawal at this rate on a daily basis. However, recharge occurs during only about 60 days per year. Unless the aquifer has enough storage capacity and its natural discharge can be eliminated, most of the recharge may spill out and leave little water to be pumped on a daily basis during the nonrecharge season. Therefore, daily recharge figures have not been stressed in this section. They will be utilized only as a tool, along with the other aquifer parameters, in determining the maximum perennial yields in the section, "Availability of Ground Water."

Discharge of Ground Water

As ground water is added to storage in the zone of saturation, it immediately begins to move toward areas of discharge such as springs, swamps, streams, and lakes. During any year, the amount of ground water discharged from any given deposit is roughly equal to the amount of recharge to it.

Ground-water discharge is important because it supplies the water for streamflow during periods without precipitation and overland runoff, or at times when all precipitation is being used to meet the demands of evapotranspiration. Therefore, streams that derive only a small proportion of their flow from ground-water discharge tend to have low flows or even to go

dry in the summer. This limits their usefulness for water supply and recreational purposes. On the other hand, streams receiving a large proportion of ground-water discharge tend to have high sustained flows during droughts and are much more important sources of water for all uses.

Ground-Water Discharge and Streamflow

Previous discussions have stressed the differences in the amounts of ground water that is recharged to, stored in, and discharged from various unconsolidated deposits and bedrock depending on factors such as porosity, permeability, and amount of potential recharge. This discussion illustrates the relationship of ground water to the streamflow regimen.

Daily discharge hydrographs for two streams in the Western Oswego River basin, Cayuga Inlet near Ithaca and Salmon Creek at Ludlowville, are shown in figure 20. The flow of each stream is shown in cubic feet per second per square mile of drainage area to eliminate differences in the quantity of discharge due to differences in the size of the drainage areas. Both streams have mean discharges of 0.42 cfsm (cubic feet per second per square mile) for the period shown in figure 20.

As the graphs show, the maximum daily discharges of 6.10 cfsm for Cayuga Inlet and 4.89 cfsm for Salmon Creek are not significantly different. However, the low flow of Cayuga Inlet is more than 16 times that of Salmon Creek. Although the lowest daily flows in Cayuga Inlet are about 0.1 cfsm, the flow in Salmon Creek often falls well below 0.01 cfsm.

Also shown in figure 20 are estimated hydrographs of the ground-water discharge to both streams. It is simple to determine the amount of ground-water discharge to the streams during long periods without precipitation, when ground-water discharge is virtually 100 percent of the streamflow. However, during periods of high streamflow the amount of ground-water discharge must be computed either by base-flow recession curves or by the relationship between streamflow and nearby ground-water levels (Olmsted and Hely, 1962). The ground-water discharge curves in figure 20 were estimated on the basis of nearby ground-water levels and the results of other studies dealing with the relationship of ground water and streamflow (Cooper and Rorabaugh, 1963). Under peak-flow conditions, the curves are mainly estimations; but under low-flow conditions, they are nearly 100 percent accurate. The curves illustrate the difference in the approximate magnitude of the ground-water contributions to these two streams and the stabilizing influence that ground-water discharge can have on streamflow, as it does with Cayuga Inlet.

As shown in figure 20, Cayuga Inlet receives much more ground-water discharge per square mile of drainage basin than does Salmon Creek. Thus, deposits that contain large amounts of ground water in storage should be more abundant in the basin of Cayuga Inlet than in the basin of Salmon Creek. Examination of the surficial geology of these basins revealed that coarse-grained deposits (sand or sand and gravel) cover about 9 square miles (10 percent of the area) in Salmon Creek basin and about 6 square miles (16 percent of the area) in Cayuga Inlet basin. Furthermore, most of the coarse-grained deposits along the valley of Salmon Creek are thin and lie high on

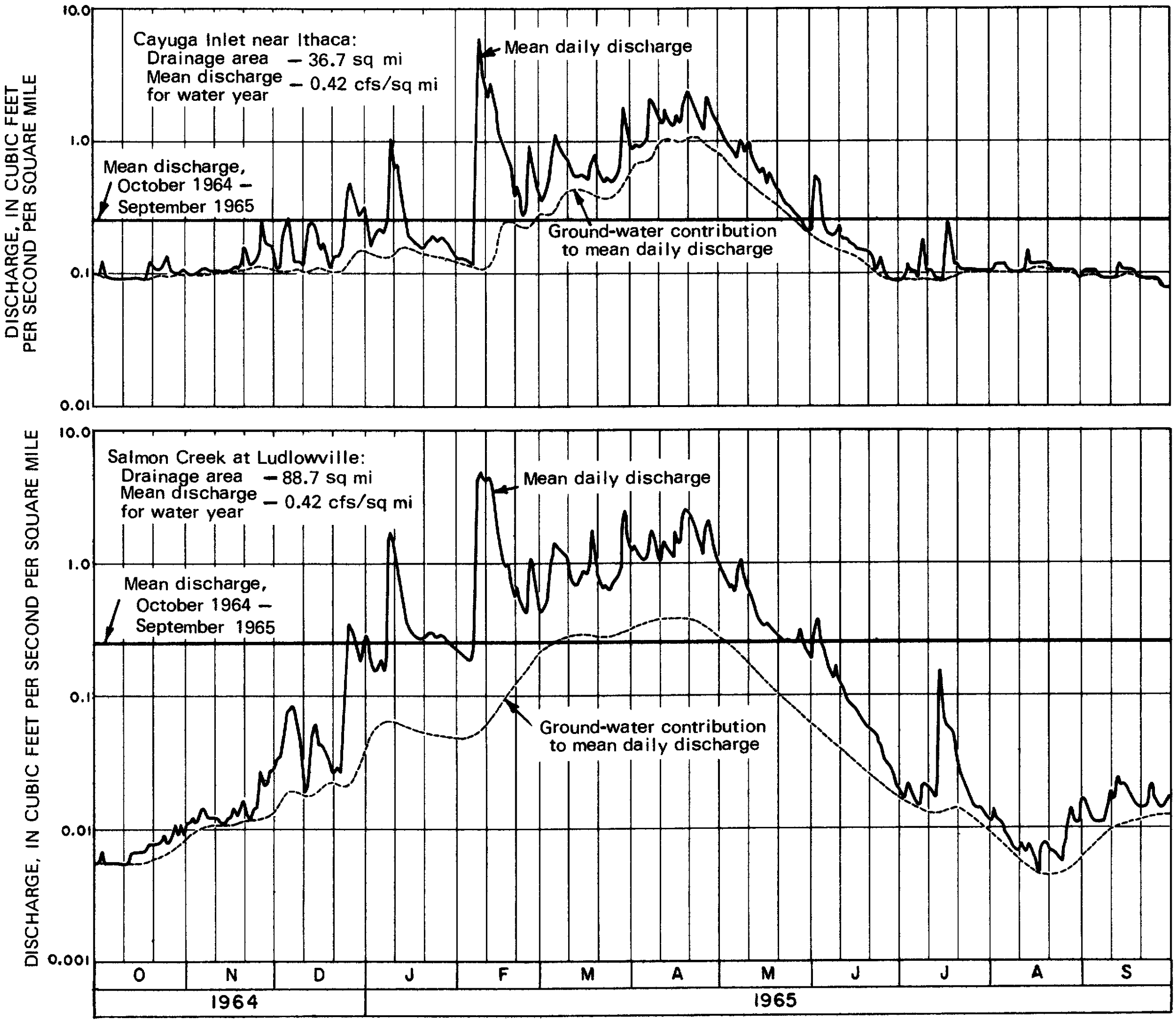


Figure 20.--Streamflow and estimated ground-water discharge in Cayuga Inlet near Ithaca and Salmon Creek at Ludlowville, October 1964 through September 1965.

the valley walls, whereas those in Cayuga Inlet basin are thick and lie in the valley bottoms. Therefore, the coarse-grained deposits drained by Cayuga Inlet have a much larger storage capacity and drain more slowly than those in Salmon Creek basin.

In figure 21, the percentage of coarse-grained deposits in the drainage areas of six gaged streams in the Western Oswego River basin are plotted against the lowest daily discharge for each stream during the 1965 water year (U.S. Geological Survey, 1965). Streamflow records for Canoga Creek at Canoga and Flint Creek at Phelps were not used because the former is supplied by ground-water discharge from limestone and has a doubtful ground-water drainage area and the stream at the latter site loses water as it crosses a limestone outcrop. This condition renders the low-flow data invalid for the purpose discussed here. The low flow for Fall Creek was adjusted for withdrawals made by Cornell University. Although the lowest flows of Red Creek and Kendig Creek were actually zero, they are plotted on the 0.0001 cfsm (practically zero) line in order to show them on the graph.

Further evidence that low flow of streams depends on the amount of ground-water storage in coarse-grained materials is provided in figure 21. As the percentage of coarse-grained material in each drainage basin increases, the lowest mean daily discharge increases. The two streams without flow lie in areas having the least precipitation in the basin, and this undoubtedly also influences their discharges to some degree.

Figure 21 is only intended to be used for illustrative purposes because the number of stations and lengths of records are not sufficient to establish a useful relationship for the basin as a whole. However, with sufficient records, this method could probably be useful in predicting low flows in ungaged drainage basins.

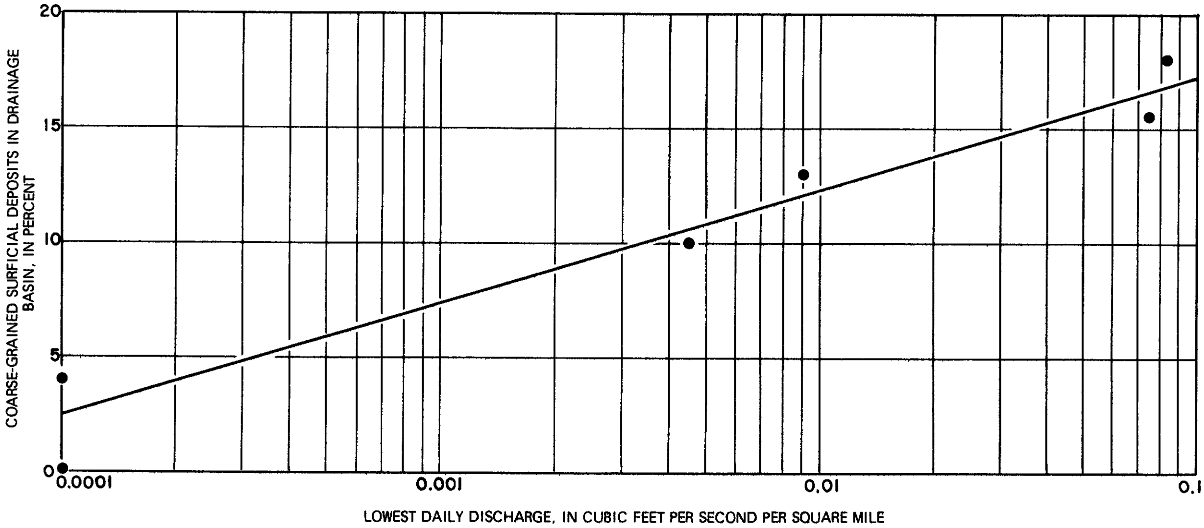


Figure 21.--Relationship of coarse-grained deposits to lowest daily streamflow for six drainage areas in the Western Oswego River basin, October 1964 through September 1965.

Ground-Water Discharge to Lakes

Ground-water discharge to streams in the Western Oswego River basin can be estimated on the basis of streamflow measurements. Measurement of the ground-water discharge to the larger lakes in the basin, either directly or indirectly, is nearly impossible; but an estimate can be made.

A water-budget method that takes into consideration surface-water inflow, outflow, and evaporation from the lake surface could be used; but an initial error of 0.1 foot in estimating the evaporation from, or precipitation over, one of the larger lakes would amount to a final error of more than 180 million cubic feet of water. Thus, computations using basic hydraulic principles and the parameters determined during this study will probably yield more accurate results than those obtained by the water-budget method.

The ground-water flow system in the vicinity of Cayuga Lake is shown in figure 22. In examining this system, one can see that direct inflow to the lake bottom must pass through a vertical plane at the shoreline. Computation of the flow through this vertical plane determines the flow into the lake along that length of shoreline. Specific capacity data for wells tapping bedrock in the Cayuga Lake basin (table 5) indicate that the average transmissibility of the upper 100 feet of bedrock is about 100 gpd per ft. However, deep test wells indicate that permeability decreases to virtually zero at 1,400 to 1,500 feet. Therefore, 750 gpd per ft may be a reasonable estimate of transmissibility for the entire permeable part of the bedrock.

The average ground-water gradient toward Cayuga Lake is about 1 foot per 44 feet of horizontal distance. The inflow to the lake along a given section of its length can be computed by use of Darcy's law (Q = TIW). For simplicity of computation, a length of 1,000 feet was chosen.

For these parameters, Darcy's law may be stated:

Q = TIW	T = bedrock transmissibility in gpd per ft
Q = 750 (1/44 x 1,000)	I = gradient in ft per ft
Q = 17,000	W = length of section in ft

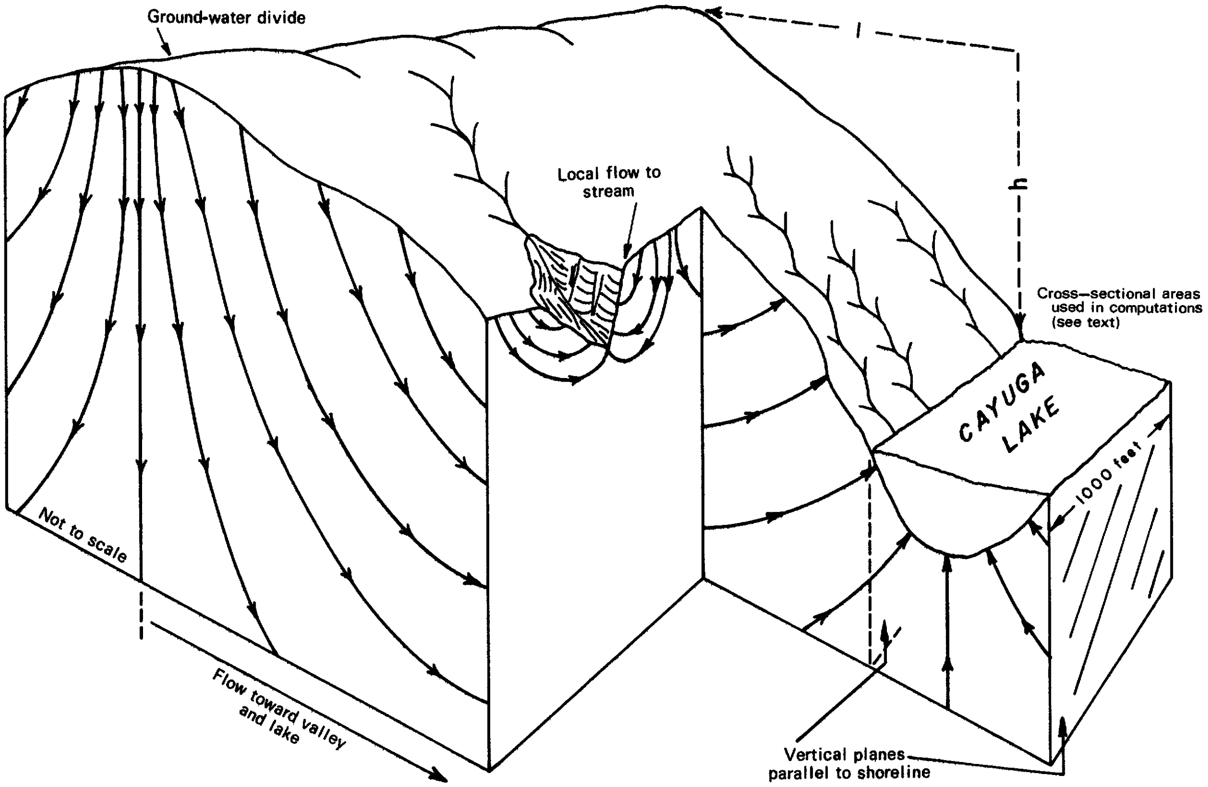


Figure 22.--Ground-water flow in the area of Cayuga Lake.

Cayuga Lake is about 196,000 feet long, and, to account for inflow along both sides of the lake, this figure must be doubled. Thus 2 x 196 x 17,000 gpd yields a daily inflow to the lake of 6,664,000 gpd, or just over 10 cfs (cubic feet per second).

One way to check the validity of this computation is to perform the same analysis on a basin where ground-water discharge can also be measured by some other means and then to compare the two results. This was done for Salmon Creek, which lies just east of Cayuga Lake and is deeply entrenched in the same type of rocks as the lake. The average ground-water gradient toward the creek was determined to be about 300 feet in 2 miles, the length of the stream system is about 90,000 feet. Only the top 400 feet of bedrock was considered to be involved in the flow system, and its transmissibility was assumed to be about 350 gpd per ft. Substitution of these values into Darcy's equation gives:

$$Q = 350 \frac{(\ 300\ )}{10,600} 1,000 \times 2 = 19,800 \text{ gpd}$$

Discharge for the entire length of stream would be:

$$Q = 19,800 \times 90 = 1,780,000 \text{ gpd or slightly less than 3 cfs}$$

This is more than the lowest measured flows of about 0.5 cfs during the 1965 water year (U.S. Geological Survey, 1965). The lower measured flow can be accounted for in part by evapotranspiration losses from the stream and its banks. During November 1964, when evapotranspiration losses were low, flow in the stream was between 1 and 2 cfs. Thus, the computations of ground-water inflow from the bedrock may be somewhat high, but they are certainly within the right order of magnitude.

Therefore, the computation of the ground-water discharge into Cayuga Lake is within a reasonable degree of accuracy, although it is probably high. Because Seneca Lake has a basin of dimensions similar to those of Cayuga, its ground-water inflow is probably on the order of 10 cfs, too. Canandaigua and Keuka Lakes have much smaller and shallower basins than the larger lakes, and ground-water inflow to them is probably considerably less than half the inflow computed for Cayuga Lake.

Because the ground-water inflow into Cayuga Lake is less than 2 percent of its mean discharge, such inflow is probably not an important factor in the total water budget of Cayuga Lake and the other Finger Lakes.

Availability of Ground Water

Maximum availability of ground water, on both an individual-well and a perennial-yield basis, from the various aquifers in the basin is discussed in this section. There are no easy criteria by which the ground water available from each aquifer can be assessed. As discussed in the previous sections, some of the factors that must be evaluated for each individual water-bearing deposit are: (1) permeability, (2) topographic position, (3) thickness, (4) areal extent, and (5) natural recharge. Two additional criteria that have not been discussed previously, and which must be evaluated fully, are induced infiltration and available drawdown.

Induced infiltration to an aquifer represents increased recharge caused by lowering the water table below the elevation of an adjacent stream or lake through pumping. A prime example of the effect of induced infiltration is found in the delta deposits in the four lakes mentioned in the preceding section. These deposits are small in surface area and, if found in the uplands, would be insignificant sources of ground water. However, as ground water is pumped, the water table is lowered below the level of the adjacent lake, and a gradient between the lake and the well is established. This causes the lake water to move into the delta and to replace the ground water removed from storage. The lake can supply water indefinitely to replace the water pumped from the delta deposits. In addition, water is carried to the deltas by the streams that cross them from the uplands; this streamflow also infiltrates the delta to replace water lost from storage. Because of these sources of induced recharge, the small deltas are excellent sources of ground water.

Available drawdown is also extremely important when considering the amount of water that can be recovered from an aquifer, especially from individual wells. For example, what are the yields of two aquifers each with a saturated thickness of 10 feet, the same permeability, and containing water in storage equivalent to a pumping rate of 1 mgd if one is a water-table aquifer with its bottom only 10 feet below land surface and the other is an artesian aquifer with its bottom 50 feet below land surface and a potentiometric surface near land surface? According to Darcy's Law, all other factors being equal, the yield of a well is proportional to the gradient that can be established. Therefore, the well with the greatest possible drawdown, allowing the steeper gradient, will have the greatest yield. For this reason, 10 widely separated wells might be needed to recover the available water from the hypothetical aquifer lying at a shallow depth; however, one well might be sufficient for the deeper aquifer if the potentiometric surface remained above the bottom of the confining bed.

The computation of maximum perennial yields must involve consideration of all the parameters mentioned in the three preceding paragraphs. A "poor" rating for any one of these factors can be important enough to overshadow the value of any of the others. However, exact values for any or all the factors are seldom known for any given water-bearing deposit. This means that such factors must be estimated on the basis of available geologic and hydrologic evidence. For this reason, values given for maximum perennial yields must also be estimates whose accuracy depends on the completeness and the accuracy of the available data.

To describe the availability of ground water in the basin as completely as possible, plates 2 and 3 were prepared. These maps are based on all the factors that have been discussed. Much of the basic data used in preparing these maps are in the tables of well and spring records (tables 5 and 6) and in the graphic well logs (table 7) at the end of this report. The probable range of individual well yields in the basin as well as the geologic situation in which the principal aquifer occurs are shown in plate 2; perennial yields, on a daily basis, for the various water-bearing deposits are shown in plate 3. Neither plate alone answers all the questions about availability. For this reason, the two plates must be used together. After determining the amount of water available from a certain area in plate 3, a check of plate 2 will show if the rate of withdrawal is compatible with the intended use. For

example, if one were interested in locating a ground-water supply in the valley of Naples Creek, north of Naples and south of Canadaigua Lake, an examination of plate 2 would show that the most productive aquifer in that area consists of sand and gravel overlain by silt and clay and that the aquifer is capable of yielding 100 to 500 gpm to individual wells. Plate 3 would show that the aquifer is capable of yielding 2 to 4 mgd per sq mi on a perennial basis. By calculating the area of the aquifer, one can determine that the total yield of the deposit is between 5 and 10 mgd. Because Naples Creek valley is one of the more productive areas in the basin, the estimated yield of the aquifer is already shown on plate 3 (6 mgd).

If greater detail were required on Naples Creek valley, plate 1 could be consulted to find the location of any wells inventoried in the area. By checking these wells in tables 5 and 7 one would discover that the sand and gravel deposits are thick, indicating a high transmissibility, and that they are overlain by a thin layer of silt and clay. Therefore, one would then know that the individual well yields would be near the maximum values in plate 2 and that relatively shallow wells could probably be used to develop the deposit. Naples Creek valley is discussed further under "Naples Creek and West River Valleys."

Because of the vast number of water-bearing deposits in the basin, it is impossible to discuss them individually. Therefore, in the remainder of this section only the more important deposits or those in hydrologic situations that are common throughout the basin will be discussed in detail. For ease in discussion, this section has been divided according to both geographic locations of the various aquifers and aquifer composition.

This section is concerned with only the amounts of ground water available and not with restrictions that might apply to the actual use of the water because of inferior chemical quality. Information on the chemical quality of ground water in the basin will be presented in a separate report.

Central Lowland

The Central Lowland covers the northern part of the Western Oswego River basin (fig. 4). A much larger proportion of the Central Lowland is covered by coarse-grained material than is the rest of the basin. Also, as shown in figure 5, almost all the carbonate rocks and shales containing soluble rocks in the basin are in this region. For these reasons the area is quite distinct hydrologically from the southern part of the basin.

Unconsolidated-deposit aquifers

All the unconsolidated deposits in the Central Lowland are used as sources of water supply. However, the coarse-grained deposits (sand, and sand and gravel) far outweigh the others in importance.

Coarse-grained deposits.--Because deposits of sand and sand and gravel cover a very large part of the Central Lowland, one might assume that the area has an abundance of important sand and gravel aquifers. However, as

discussed in the section, "Unconsolidated Deposits", most of these deposits consist of glacial outwash laid down on a surface of low relief, resulting in deposits that are usually thin. This is especially true of the surficial sand and gravel in the western half of the region. Cross sections of some deposits in this area are given in figure 23.

Section A-A' is in the area of extensive surficial sand and gravel deposits northeast of Palmyra (fig. 23A). As shown by the section, the deposits along the Barge Canal and Ganargua Creek contain much fine-grained material. In contrast, sand and gravel deposits tend to be perched above the level of both the Barge Canal and the creek, and, thus are not favorably situated for large ground-water developments. The sand and gravel deposits in much of the western half of this part of the Central Lowland occupy similar elevated positions. Wells tapping such deposits must be developed in the thin saturated zone at the base; the deposits in this thin zone hold very little ground water in storage. In the summer, when recharge stops and the deposits drain, wells may go dry unless they are in a low-lying part of the deposits. For these reasons, yields of wells tapping these deposits tend to be low (pl. 2). In fact, the saturated zones of many of these deposits may be too thin to be developed.

The saturated zone in the coarse-grained deposits is thick in a few areas, and large yields may be developed. In the village of Macedon, well 430414N077-1928.1 yields 275 gpm; in the village of Manchester, well 425802N0771512.1 yields 300 gpm. However, yields of both wells are reported to decline at certain periods of the year.

Yields of the wells at Macedon decline during the winter. This may seem unusual because ground-water levels would be expected to be higher during the winter than during the summer. However, the wells at Macedon tap a rather thin saturated zone below the altitude of the Barge Canal, which lies about 2,500 feet to the north. Therefore, ground water pumped from the wells is probably replenished by infiltration from the Barge Canal. During the summer, enough water enters the aquifer to meet the pumping demand. However, in the winter the Barge Canal level is usually lowered. Furthermore, in the winter, temperature of the water in the canal decreases and viscosity of the water increases. The higher viscosity has the effect of decreasing the induced infiltration and the transmissibility of the thin saturated zone. As a result, ground-water levels decline even when canal level is not lowered, and less water reaches the wells. Such a relationship between an aquifer and induced recharge from a stream in eastern New York has been examined thoroughly (Winslow and others, 1965). More water might be induced to recharge the deposit at Macedon by diverting more canal water into the deposit in a manner discussed in the section, "Artificial Recharge."

The wells at Manchester decline during the summer because of a lack of recharge and the low storage capacity of the deposits. At this time, the village supply is supplemented by that of the village of Palmyra.

Sand and gravel aquifers along the Barge Canal and in the kame deposits south of Victor are thicker and more productive than other sand and gravel aquifers in the western part of the Central Lowland. The Barge Canal generally follows a glacial stream channel cut through the unconsolidated deposits.

This channel has been previously described in the section, "Unconsolidated Deposits," and has been postulated as a potential source of large ground-water supplies in Wayne County (Griswold, 1951). However, an examination of available well logs and test borings and of test drilling during 1966 established that the channel is generally very shallow and that bedrock is usually within a few feet of the land surface. In general, the deposits of sand and gravel are thick enough to provide substantial ground-water supplies in only three areas--(1) east of Macedon, (2) at Newark, and (3) at Lyons.

At the site of well 430347N0771547.1 east of Macedon, test borings indicated that the sand and gravel is about 40 feet thick and that it extends below the level of the nearby Barge Canal. Water can be induced to enter the deposit, and a fairly high perennial yield may be expected. Well 430347-N0771547.1 was pumped at 337 gpm, which indicates a fairly high permeability for the deposits.

The aquifer at Newark is one of the most productive in the Central Lowland because it taps a fairly thick sequence of permeable sand and gravel in hydraulic contact with the Barge Canal. A fence diagram of the unconsolidated deposits in the vicinity of Newark is shown in figure 24C. (The hills around the deposits are not drawn to scale but have been sketched in to show the approximate locations of the valley walls.) The unnumbered borings running from west to east across the figure are borings for the Barge Canal. They show the deposits along the canal and denote location of the canal. As shown in figure 24C, the deposit of sand and gravel is not very large; and where it underlies a terrace near well 430338N0770553.1, most of the deposit is above the level of the canal. However, to the south of well 430256N0770527.1, in the vicinity of the unnumbered canal boring, a thick sequence of sand and gravel is in hydraulic connection with the canal. Therefore, abundant water is available to recharge this part of the aquifer and to replace the amount pumped. More than 1 mgd has been withdrawn from this aquifer through well 430256N0770527.1, whose yield has been reported to be 1,000 gpm. A yield of about 3 to 4 mgd could probably be obtained from the aquifer in the area adjacent to the canal and perhaps an additional 1 to 2 mgd in the deposit of sand and gravel in the vicinity of, and north of, well 430350N0770520.1.

The hydrologic situation at Lyons is similar to that at Newark because a permeable deposit of sand and gravel is below the elevation of the Barge Canal. Apparently the deposits are not in complete hydraulic contact with the canal, at least in the section B-B' (fig. 23). The contact seems to be much better along the canal to the west of the wells plotted in figure 23. Well 430349N0765656.1 at the Lyons well field (not shown) reportedly has a yield of 1,000 gpm and a specific capacity of 55 gpm per ft, which indicates a transmissibility of about 100,000 gpd per ft. However, the specific capacity of the well has probably been reduced through well inefficiency. An aquifer test at the Lyons well field in 1950 (Griswold, 1951, p. 27) indicated a transmissibility of 860,000 gpd per ft for the aquifer. Because of the thickness of the aquifer and the degree of hydraulic contact with the Barge Canal, up to 4 mgd could be withdrawn from the aquifer if a fairly stable water level were maintained in the Barge Canal.

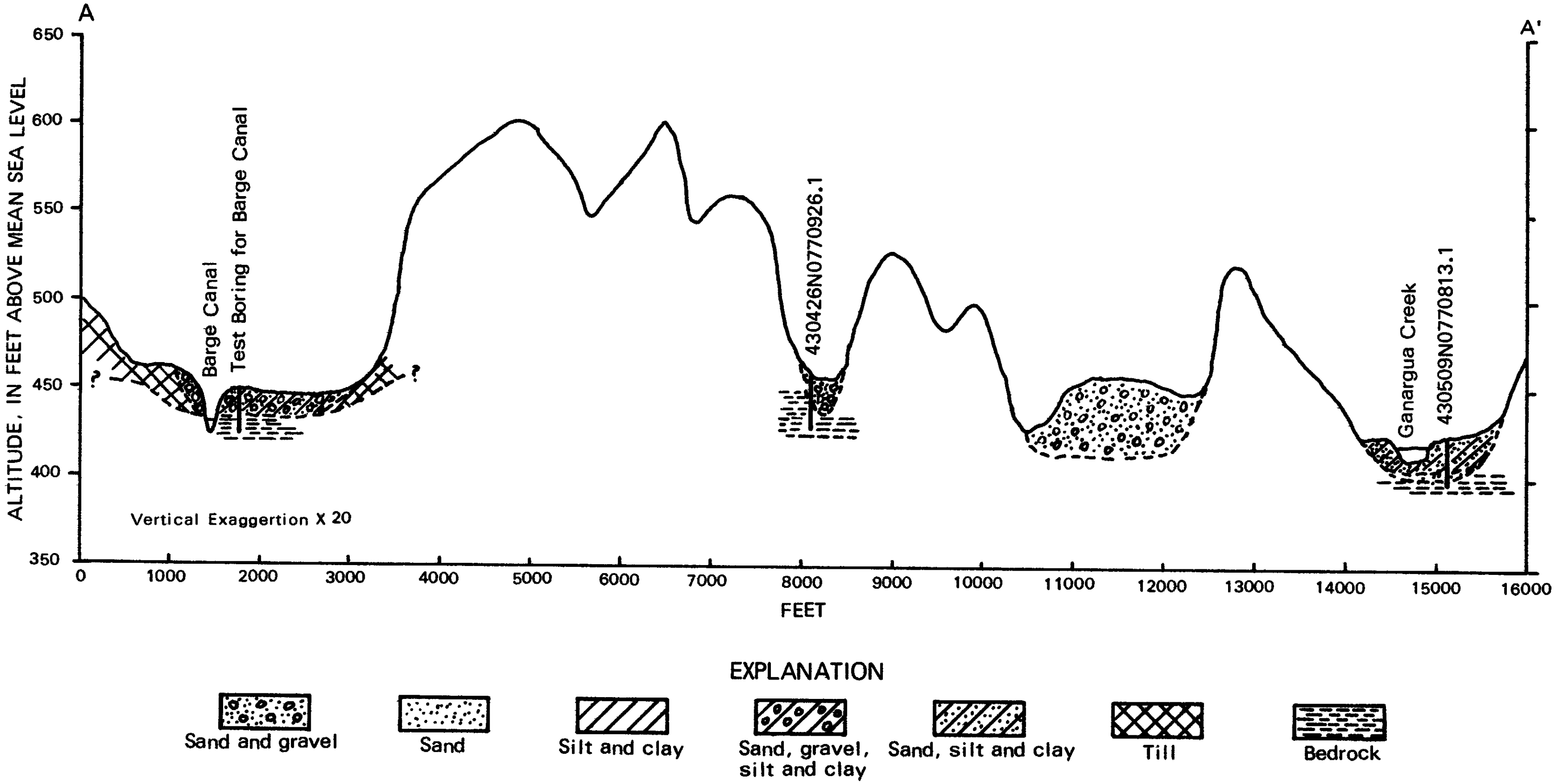
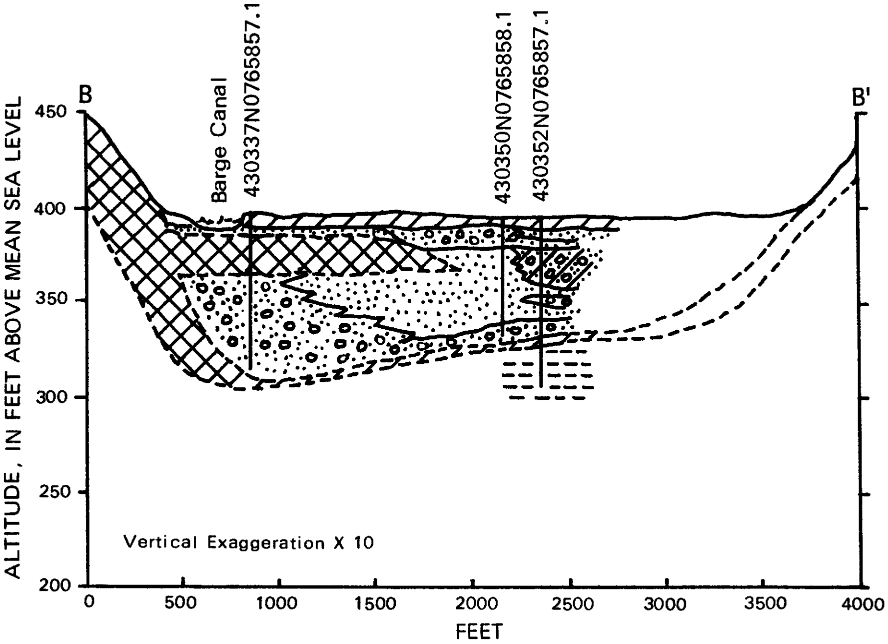


Figure 23A.--Geologic section of selected deposits in the Western Oswego River basin and some typical unconsolidated deposits in the Appalachian Plateau. (Line of section shown in plate 1A.)



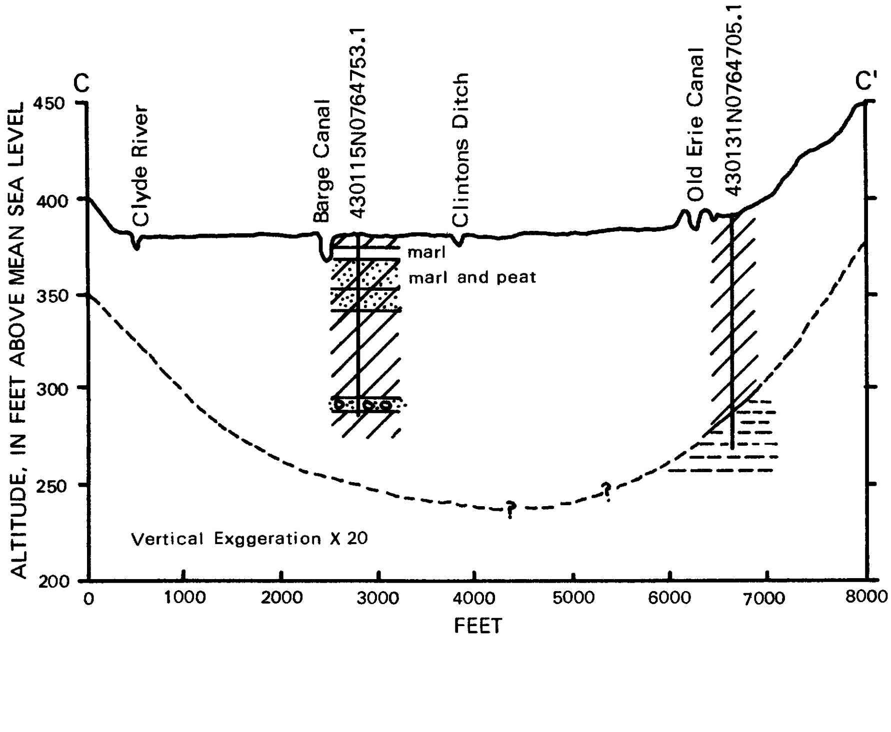


Figure 23B.--Geologic sections of selected deposits in the Western Oswego River basin and some typical unconsolidated deposits in the Appalachian Plateau.
(Lines of sections shown in plate 1A.)

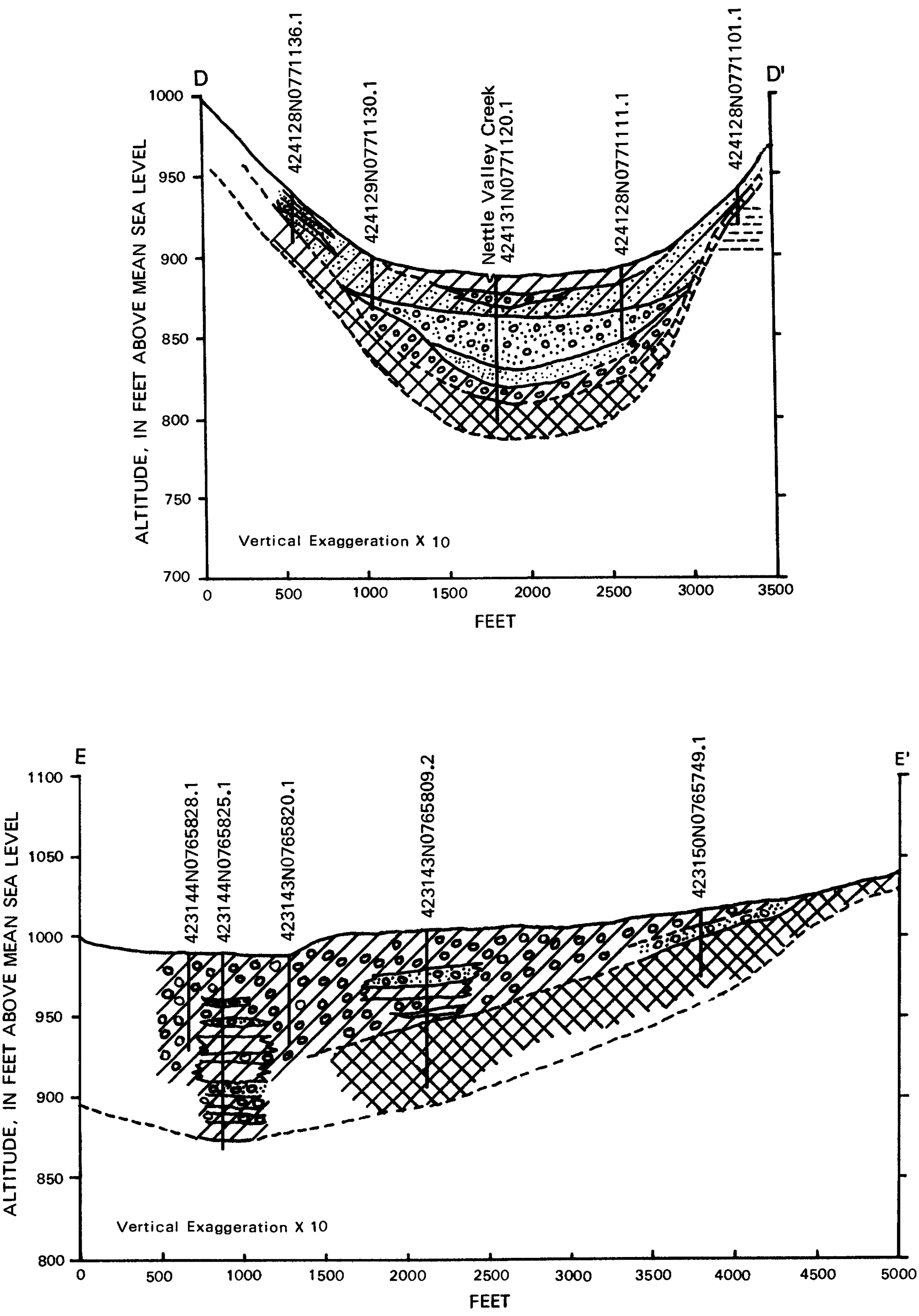


Figure 23C.--Geologic sections of selected deposits in the Western Oswego River basin and some typical unconsolidated deposits in the Appalachian Plateau.
(Lines of sections shown in plate 1B.)

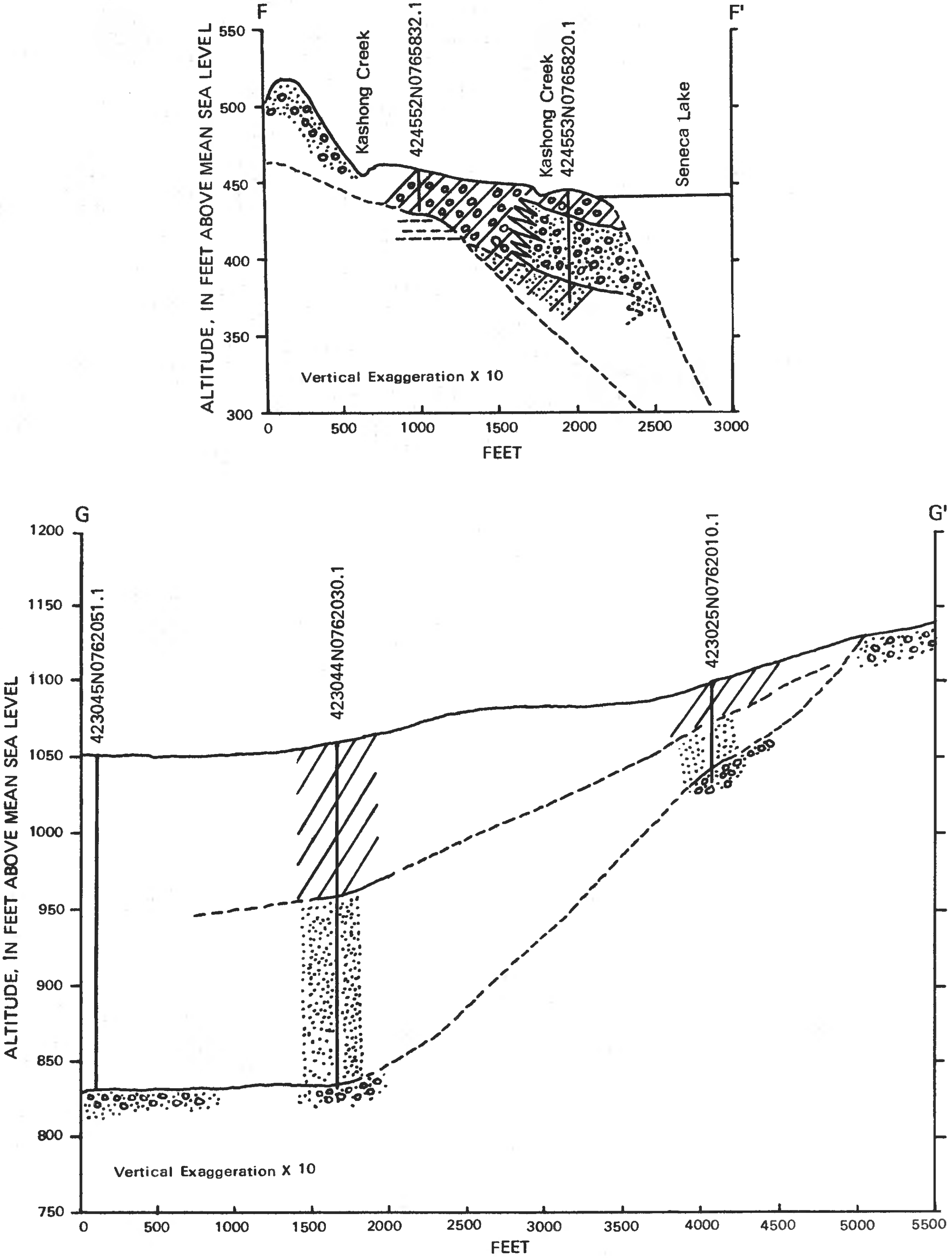


Figure 23D.--Geologic sections of selected deposits in the Western Oswego River basin and some typical unconsolidated deposits in the Appalachian Plateau.
(Lines of sections shown in plates 1A and 1B.)

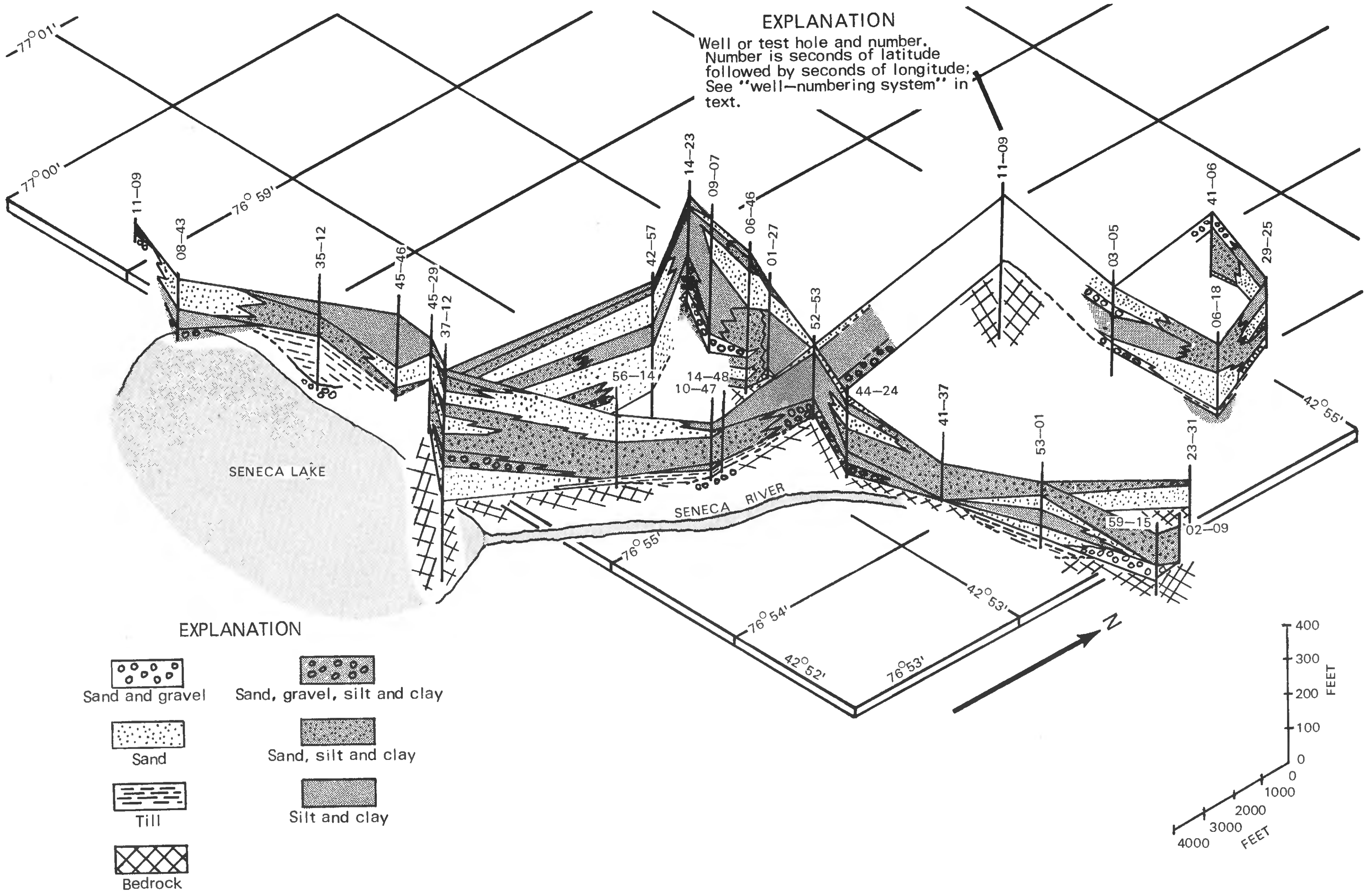


Figure 24A.--Unconsolidated deposits at selected locality in the Western Oswego River basin. (North of Seneca Lake)

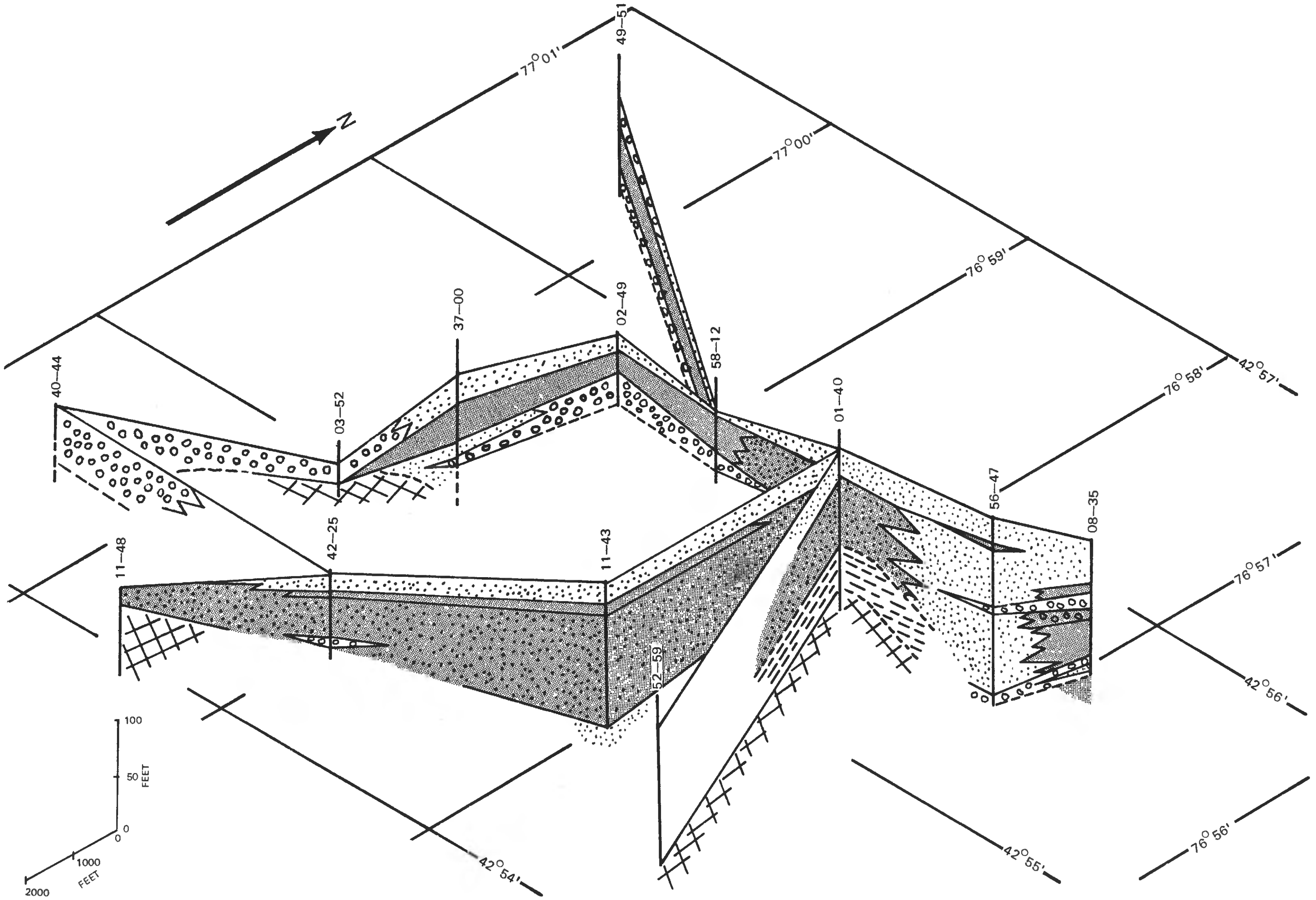


Figure 24B.--Unconsolidated deposits at selected locality in the Western Oswego River basin. (Northwest of Seneca Lake)

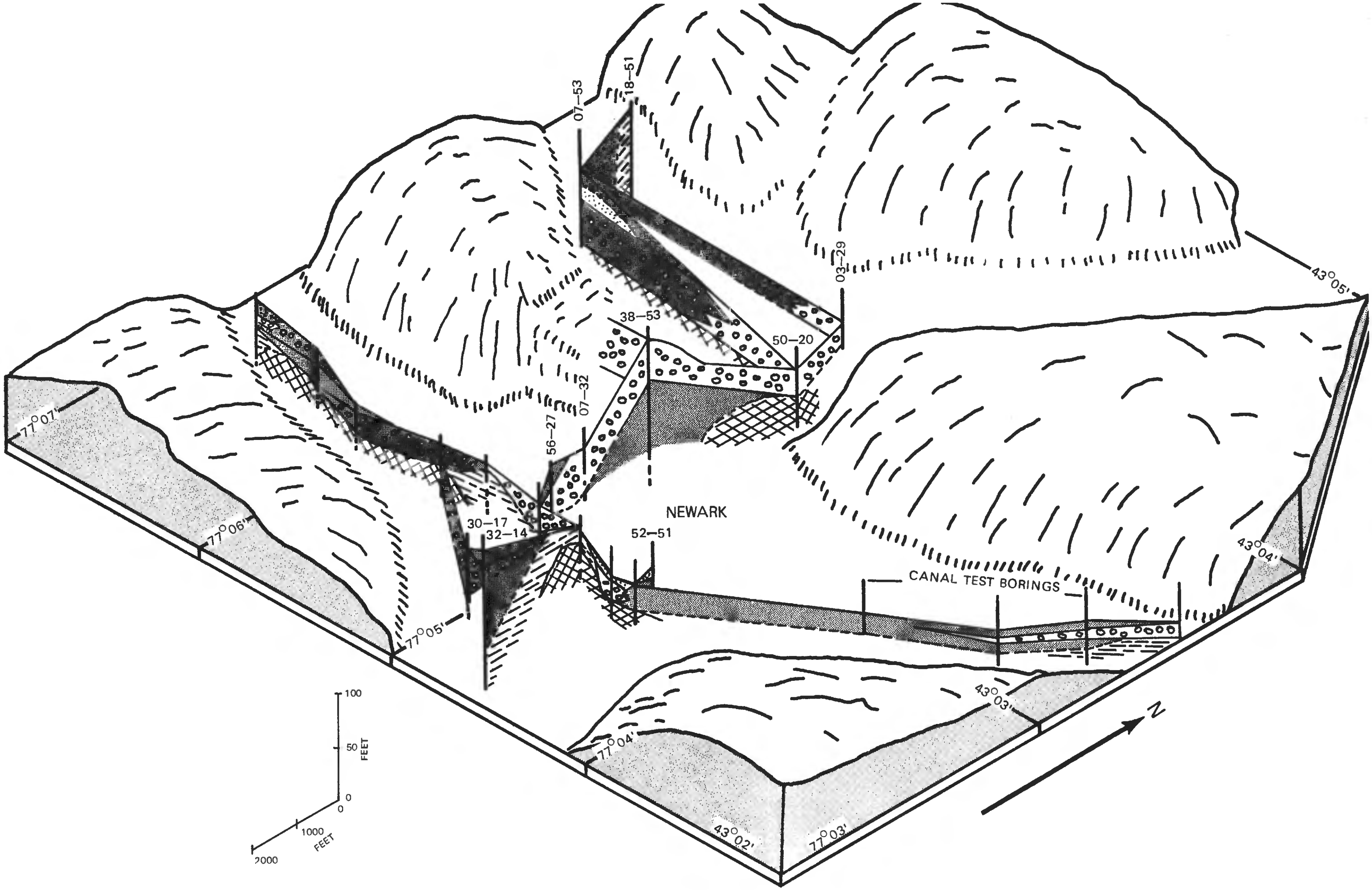


Figure 24C.--Unconsolidated deposits at selected locality in the Western Oswego River basin. (Newark and vicinity)

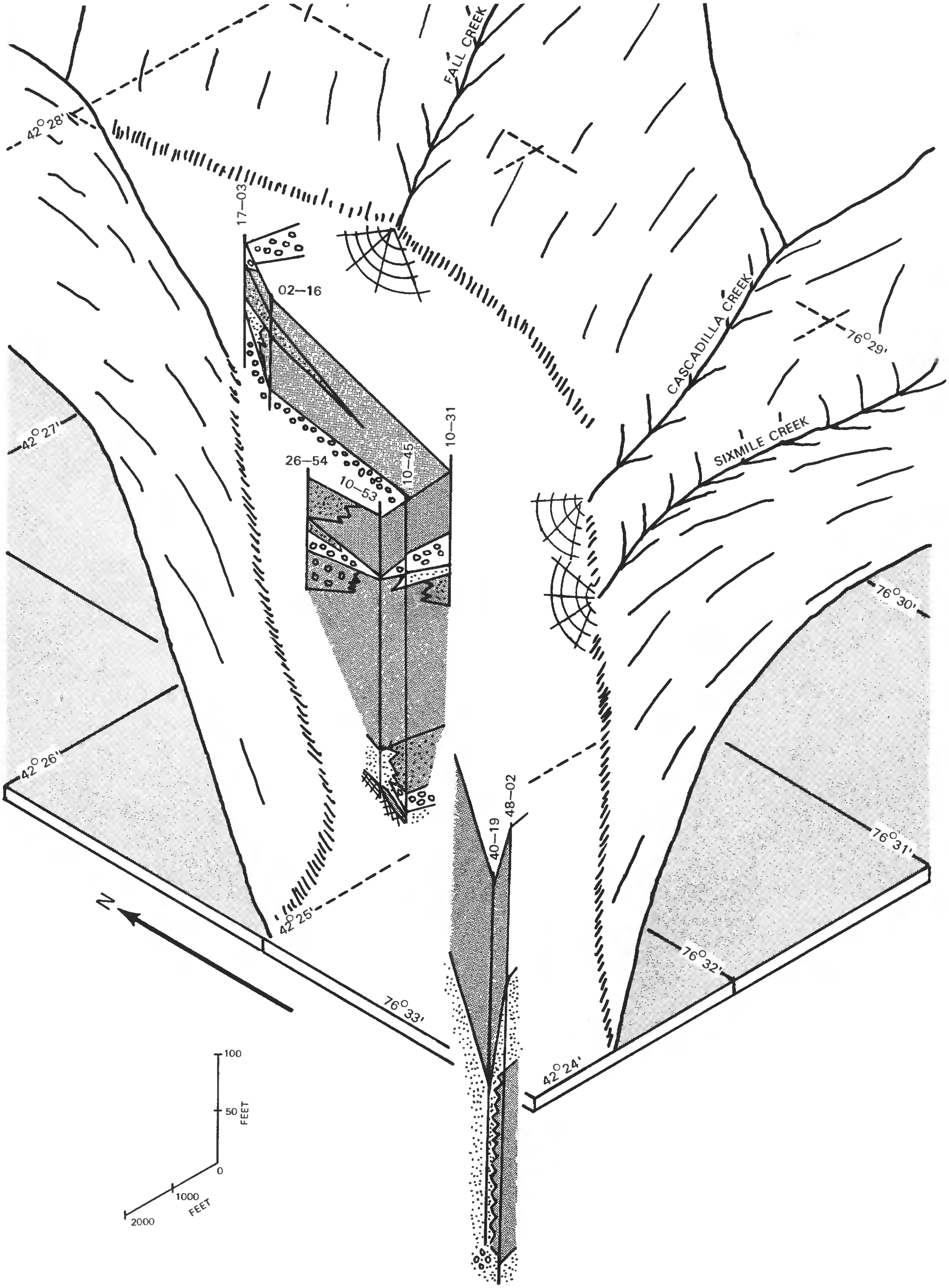


Figure 24D.--Unconsolidated deposits at selected locality in the Western Oswego River basin. (Fall Creek valley near Ithaca)

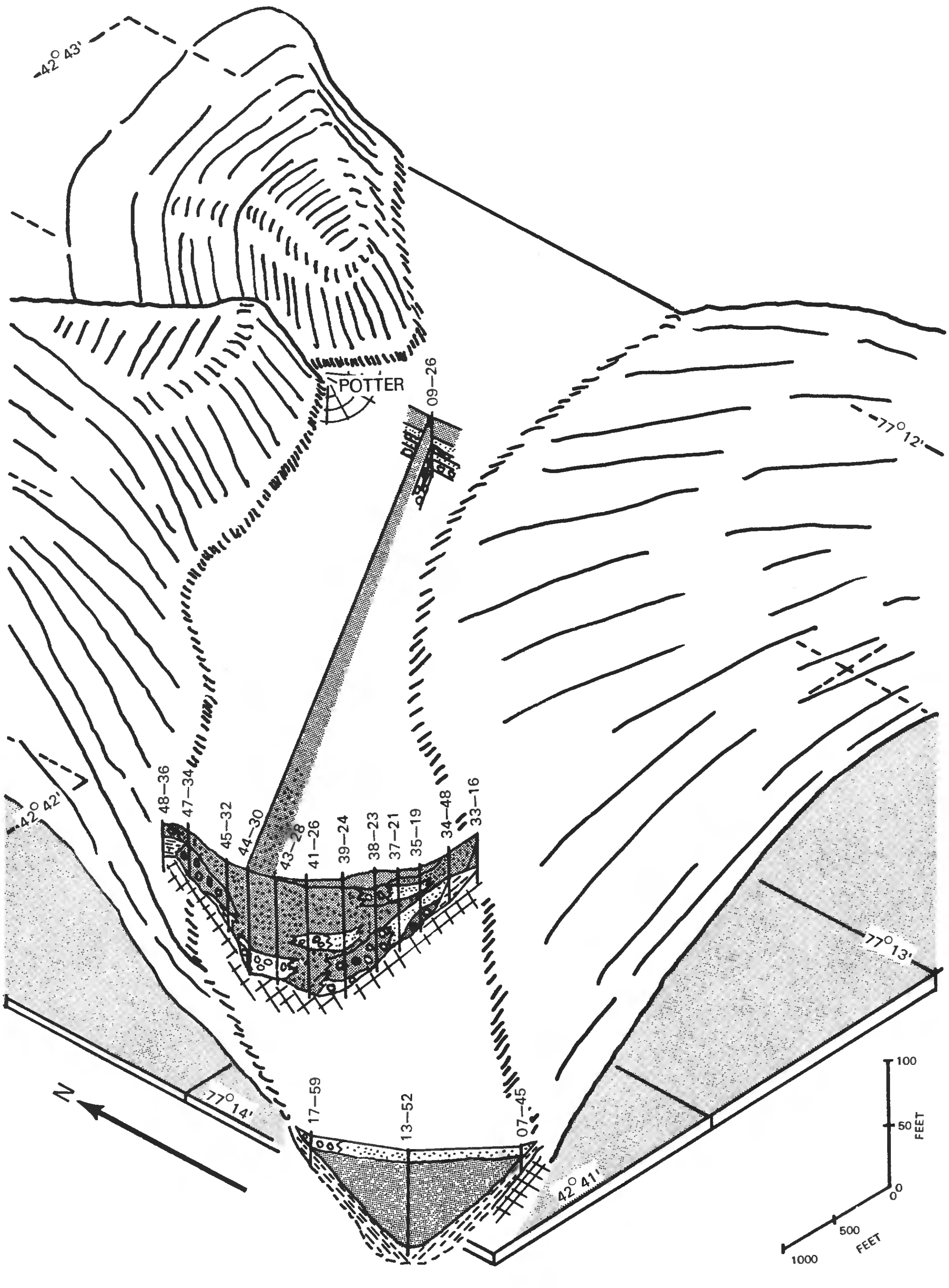


Figure 24E.--Unconsolidated deposits at selected locality in the Western Oswego River basin. (Flint Creek valley near Potter)

The only other highly productive sand and gravel aquifer in the western part of the Central Lowland is in the kame area southwest of Victor where there are very extensive thick deposits of sand, and sand and gravel. Much of the material drains readily, however, and can receive recharge only from precipitation. Also, the deposits consist mainly of rather fine sand; therefore, well yields are not particularly high, except for the area around well 425536N0772806.1 (table 5). When drilled, this well flowed at about 250 gpm. The confined zone that the well is tapping seems to be recharged through the deposits to the south and east, and apparently the deposits in this immediate area can yield about 3 mgd.

The eastern half of the Central Lowland differs from the western half. In general, the unconsolidated deposits are confined to the valleys and are somewhat thicker than those in the western half; and the scattered and extensive deposits of outwash are not as evident as those in the western half. Some of the valley fill north of Cayuga Lake is more than 200 feet thick. Although the deposits have large saturated thicknesses, they are generally fine-grained. Extensive lake deposits of silt, clay, and fine sand are found throughout the valleys. A typical situation in one of the valleys southeast of Savannah is shown in section C-C' (fig. 23). As shown by the figure and by an examination of well logs from the area, layers of sand and of sand and gravel are commonly interbedded in thick sequences of fine-grained material. Although some of these zones may have fairly high transmissibilities, the only available recharge is usually through the overlying lake deposits. This results in low perennial yields (plate 3).

In the northeastern part of the Central Lowland, the deposits generally represent areas where glacial melt water deposited the coarser fraction of its load in lakes or where the lakes were shallow. In many of the northern valleys, the coarse-grained deposits are both at the surface and beneath thin lake deposits. Therefore, they are more easily recharged and have higher perennial yields than aquifers in the deeper valleys farther south. In much of the northern part of the area, the deposits are in hydraulic contact with the Barge Canal, or with perennial streams. This greatly increases the maximum yields of the deposits. Two notable examples of wells in hydraulic contact with the canal are the wells supplying the villages of Savannah and Clyde. The reported yield of well 430514N0765326.1 at Clyde is more than 300 gpm and of well 430523N0765339.1 to the west of Clyde is 175 gpm, which indicate that substantial supplies can be developed in some of these deposits. The yields of many deposits, however, are limited by their thinness, which results in low transmissibilities and, therefore, low individual well yields.

The most extensive area of unconsolidated deposits in the entire Central Lowland lies in the area northeast of Geneva. Here, glacial melt water, which followed the route of the present Canandaigua Outlet, poured into a lake that once covered the entire area north of Seneca Lake and east to Waterloo. This melt water and southward-flowing melt water from the ice sheet created an extremely complex system of unconsolidated deposits.

The relationship between the various unconsolidated deposits in the area northeast of Geneva is shown in figure 24. In many places, the total depth of these deposits is more than 200 feet. Again, much of the material is fine grained. Even the deposits shown as sand on the fence diagram tend to

be fine grained and generally do not yield large supplies of water to wells. There are many scattered layers of sand and gravel throughout the deposits, and some of the wells tapping these layers have been pumped at rates of more than 200 gpm. Although no direct connection with perennial streams is evident for any of these sand and gravel aquifers, complex connections no doubt exist. Also, water stored in the thick deposits of fine sand may be withdrawn by developing some of the thin sand and gravel layers. For these reasons, yields of 1 mgd per square mile of aquifer area seem reasonable. Areas close to the lake and the Barge Canal could probably obtain recharge through the overlying sands and might have higher yields than areas farther away.

One type of sand and gravel aquifer not shown in plates 2 or 3 is interbedded with the overlying glacial till. As discussed in the section, "History of Deposition," field observations showed that the cores of almost all the drumlin-shaped hills in the Seneca Falls area seem to contain either sand and gravel or sand. One of these sand zones, in a drumlin-shaped hill breached by a ditch, yielded 30 gpm during late summer. (See spring 425705N0764555.1 in table 6.) A check of well logs in table 7 shows that many other drumlins in the area contain coarse sand zones.

Drilling on the flank of one of the drumlins in an attempt to intercept one of the coarse sand zones probably offers the best chance of locating a well in one of the drumlin areas shown as till overlying bedrock in plate 2. Because these sand and gravel deposits are usually very permeable, their yield tends to exceed that of the underlying bedrock. Even if the zones themselves are too thin or unproductive to be developed directly, the bedrock underlying them would probably be more productive than it would be without the thin zones because the coarse material would act as a conduit for recharge to the bedrock. Drilling on top of a drumlin does not seem feasible because the additional depth of material that would have to be penetrated would increase the well cost without guaranteeing additional well yield.

Till and lake deposits.--Deposits of till and silt and clay are very extensive in the Central Lowland. As previously discussed, these deposits have a very low permeability and yield water very slowly to wells. For example, well 425200N0764451.1 (table 5), south of Seneca Falls, taps both lake deposits and till and was pumped virtually dry in June 1965 by removing about 240 gallons of water. It then took 45 days for the water level in the well to recover to its original level. A rough calculation indicates that the permeability of the deposits is about 0.01 gpd per ft. Although many of the tills in the northern part of the area are undoubtedly more permeable than this, tills and lake deposits will not yield large supplies of water; and many are not productive enough for domestic supplies. Most successful wells in the till actually tap layers or lenses of coarse-grained material as discussed in the preceding section.

Bedrock

Two different types of bedrock aquifers are characteristic of the Central Lowland: (1) carbonate rocks, and (2) shales containing soluble rocks. Differing yields from well to well in the bedrock aquifers depend to a large degree on the overlying material and their topographic position.

Carbonate rocks.--Carbonate rocks crop out along two broad belts in the Central Lowland (fig. 5). The northernmost belt is composed predominantly of dolomite; the southernmost one, of limestone.

The carbonate rock in the northern part of the basin is the Lockport Dolomite. Johnston (1964, p. 22), in a study of the Lockport Dolomite in the Niagara Falls area, reported that most of the water in the rock was in solution openings along a few major bedding planes. Not enough data were collected in the Western Oswego River basin to prove a similar geologic situation, but bedding-plane joints are probably the most important water-bearing openings there. The rest of the rock is probably impermeable, which results in a low storage capacity and transmissibility for the rock as a whole. Generally, yields from wells in the Lockport range from less than 1 to about 100 gpm and are adequate for domestic use. Higher yields may sometimes be obtained in areas overlain by coarse-grained deposits or along stream valleys. For example, well 430848N0771112.1, which is only 31 feet deep and has a reported yield of 300 gpm, is in a valley bottom where the carbonate rock is overlain by 15 feet of sand and gravel. This points out the desirability of developing the carbonate rock aquifers where they are adjacent to a stream or a saturated sand and gravel deposit that will provide a source of recharge.

The carbonate rocks in the southern half of the Central Lowland are composed principally of limestone but seem to have somewhat better developed solution openings than the Lockport Dolomite and, therefore, somewhat higher permeability. The highest yields from these carbonate rocks, both to individual wells and on a perennial basis, are from those areas where the rocks are overlain by sand and gravel or are in contact with perennial streams. The wells of the village of Shortsville, where the carbonate rocks are overlain by coarse gravel, yield about 100 gpm. High yields are also obtained near the Seneca River in the vicinity of Waterloo, where the bedrock is in contact with the river and where well 425403N0765110.1 is reported to have a yield of 450 gpm.

Large amounts of water are also available from regions where the carbonate rocks are discharging ground water. These regions may discharge excess ground water drawn from a sizable area because of the complex manner in which the water moves through the carbonate rocks. For example, the discharge of Canoga Creek at Canoga, whose flow is fed almost entirely by a single large spring, would represent nearly 17 inches of surplus precipitation (runoff) during 1965-66, from an apparent drainage area of 3.2 square miles. This is about twice the expected runoff for this part of the Western Oswego River basin during 1965-66. The actual area contributing water to Canoga Creek at Canoga must be much larger than the apparent surface-water drainage area.

In areas where ground water is discharging from the limestone, very large quantities of water are often involved and large springs abound. Some of the larger springs in the basin are: (1) near Clifton Springs where one discharges approximately 800 gpm; (2) spring 425104N0764555.1 near Canoga with an average discharge of about 600 gpm; and (3) spring 425042N0764135.1 at Union Springs with a flow of about 1,300 gpm in dry weather. Wells developed in these areas may have fairly large yields. For example, well 425057N0764122.1 is owned by the village of Union Springs and has a yield of about 300 gpm. However, the development of wells in these areas may be less effective than using the springs directly.

One feature of the carbonate rock aquifers shown in plate 3 that may seem inconsistent is the perennial yields of 0.2 to 0.5 mgd per sq mi in the area south of Seneca Falls and northwest of Union Springs. Because the rock in these areas is overlain by silt and clay or till, the recharge would appear limited to less than this. However, the unconsolidated material is very thin; and the carbonate rock is exposed in most of the stream channels where it may be readily recharged. Also, there are many sinkholes in this area, as discussed in the section, "Physical Characteristics," under "Bedrock". Overland runoff is funneled into these sinkholes, which act as recharging wells and contribute vast quantities of water to ground-water storage.

Shales containing soluble rocks.--The Camillus and Vernon Shales contain soluble rocks and crop out between the carbonate rock units (fig. 5). As shown in plate 2, wells in these rocks generally tend to have somewhat higher yields than those in the carbonate rocks; most wells yield at least enough water for small domestic supplies. This indicates a high permeability, owing to the solution of interbedded salt and gypsum.

These rocks can yield only as much water on a perennial basis as is available for recharge. Therefore, the greatest yields are in low-lying areas along streams and in areas where the rocks are overlain by sand and gravel. Some extremely high yields have been obtained from this aquifer by wells near perennial streams. The yield of well 430416N0771745.1 at Macedon, for example, is reported to be 1,000 gpm.

One interesting feature of some of the higher yielding wells is that the permeability of the rocks around the wells seems to increase with time and continued pumpage. This is apparently caused by faster solution of the gypsum in the rocks in response to the increase in the velocity of the water in the vicinity of the well as it is pumped. Such solution occurred in the shale penetrated by the high yielding well mentioned above, but not with entirely favorable results. As the amount of solution around the well increased, the cavities in the rock became so large that the rock collapsed into the well; the well had to be renovated. Such collapse is likely to occur in any large-capacity wells completed in these rocks.

Appalachian Plateau

The occurrence of the major ground-water aquifers in the Appalachian Plateau part of the Western Oswego River basin is different from those in the northern part of the basin. As shown in plate 2, the deposits of sand and gravel are generally restricted to the larger valleys; only scattered deposits are found in the uplands. An examination of plates 2 and 3 also shows that both the individual well yields and the perennial yields of the aquifers in the valley bottoms tend to be higher than in the unconsolidated deposits in the northern part of the basin.

Sand and gravel aquifers

The sand and gravel in the deposits filling the valleys are by far the most important sources of ground water in the Appalachian Plateau. The sand and gravel are generally permeable, of substantial thickness, and lie on or

below the valley floors. Because the sand and gravel aquifers are generally separated from one another by till and bedrock uplands, each valley is a distinct hydrologic system. Therefore, the best way to discuss the aquifers is by individual valleys. The deposits in the different valleys are hydrologically similar, and this fact has been used in interpreting the conditions in the valleys where little reliable subsurface data are available.

Fall Creek valley.--Fall Creek valley, in the southeastern part of the area, is one of the larger stream valleys in the basin and, from the standpoint of ground-water resources, one of the most important. The upper reaches of the valley, north of McLean, seem to be the most productive. Here sand and gravel were deposited along the valley floor by southward-flowing glacial melt water. These deposits were not subsequently covered by lake deposits as they are south of McLean and, therefore, are in excellent hydraulic contact with Fall Creek throughout most of this reach of the valley.

Although no exceptionally large-yielding wells were found in the northern part of Fall Creek valley, the deposits are permeable enough to yield water at the rate of several hundred gallons per minute to individual wells. Because of the favorable topographic position of the deposits, as much as 10 mgd could probably be developed in the lower part of this reach of the valley (pl. 3).

Another important aquifer in Fall Creek valley is in the vicinity of Freeville. Here a deposit of sand and gravel is confined under 200 feet or more of fine-grained lake deposits. The water pressure in the aquifer is so high that many of the individual wells supply several homes, some with water taps on the second floor, without any pumps or storage systems. Good hydrologic data are scarce in the area, but, as shown in section H-H' of figure 23, the aquifer is apparently recharged through the large deposit of sand and gravel just east of Freeville (pl. 2). If water were recharging the aquifer along the creek valley to the northeast, or along the valley walls, it is doubtful that such pressure would develop. But the large sand and gravel deposit to the east rises to about 160 feet above the valley floor and water entering this deposit could easily supply the necessary head. One problem in determining the maximum perennial yield of this aquifer is that little well data are available. Although some of the wells tapping it are reported to have natural flows of about 250 gpm at the land surface (well 423045N0762051.1), no well log showing the thickness of the aquifer is available. When a well is drilled into the aquifer, such a large amount of water is immediately obtained that drilling deep enough to penetrate the full thickness of the deposit has not been necessary. Yields of as much as 1,000 gpm may be obtainable if the aquifer is more than a few feet thick.

The perennial yield of the aquifer seems to be limited to the recharge that can be obtained from the large sand and gravel deposit to the east plus any infiltration through the lake deposits overlying the aquifer. This amounts to about 4 mgd. However, this figure may be conservative. Because there is a large amount of available drawdown in wells tapping the aquifer (200 feet), it may be possible to induce recharge over a wider area and from permeable deposits other than those that are presently visualized. Also, if the aquifer should be receiving some recharge from the area of Virgil Creek near Dryden, the amount of induced recharge could be large.

Other important aquifers in Fall Creek valley are in the area south of Dryden and in the morainic area east of McLean. Wells in these areas tap sand, and sand and gravel, under both water-table and confined conditions. Wells near Dryden yield as much as 100 gpm, but the possibility of developing larger yielding wells seems good. The sand and gravel deposits in this area can store a tremendous amount of water. A test hole drilled near well 422844N0761724.1 was reported to have penetrated more than 300 feet of unconsolidated deposits, consisting predominately of fine sand, without reaching rock. The depth of this hole is an indication of the thickness of the deposits. The morainic area east of McLean contains much fine-grained material, but individual wells tapping sand and gravel layers have yielded as much as 150 gpm, with a specific capacity of 8.5 gpm per ft. These data indicate that substantial supplies of ground water can be developed. (See well 423318N0761509.1 in table 5.)

Cayuga Inlet valley.--The valley of Cayuga Inlet, stretching from Ithaca to the southern boundary of the basin, is typical of the large valleys at the southern ends of the four Finger Lakes. All these valleys contain similar deposits.

At the extreme southern end of Cayuga Inlet valley is a broad, flat, outwash plain of sand and gravel. This material has a high permeability but a fairly low perennial yield because it is thin and the recharge area is small. Farther north in the valley is an area of moranic deposits that contain lenses or layers of sand and gravel interbedded with thick sequences of silt and clay, till, and very fine sand. These coarse layers occur more or less at random, and, if a well taps one of them, a yield of more than 100 gpm may be obtained. However, several wells drilled in these moranic areas have not penetrated any zones that were permeable enough to warrant finishing a supply well.

The most productive aquifers in the valley, at its northernmost end, are concealed by extensive lake deposits (pl. 2). A fence diagram of the deposits in this part of Cayuga Inlet valley is given in figure 24. The hillsides are merely sketched in on figure 24 to show the boundaries of the valley. There are thick deposits of silt and clay and fine sand, especially in the vicinity of well 422448N0763202.1.

Farther north in the valley, around well 422610N0763045.1, there are at least two layers of sand and gravel. At this well, water from the lowest layer of sand and gravel flowed at about 400 gpm, and the pressure head was more than 30 feet (table 5). At one time, this deposit was considered as a possible source of supply for the city of Ithaca (Whitney, 1904). Several wells were drilled in close proximity to well 422610N0763045.1 and were developed to be pumped by the airlift method. (This method involves pumping air to the bottom of the well where the air mixes with the water. The resulting mixture of water and air, lighter than water alone, "floats" upward where it flows from the well.) When pumped, the wells would not sustain a yield of 1 to 2 mgd and were abandoned (Williams and others, 1909, p. 32). However, the hydrology of the aquifer indicates that the yield should be much greater than this. The probable reasons for the yields of these wells being inadequate are: (1) improper well construction and development; (2) close spacing of wells; and (3) an inefficient pumping method. Therefore, this lower aquifer should be reconsidered as a source of water supply.

The high heads in the lower sand and gravel deposits suggest that the deposits are in hydraulic connection with and recharged through the morainic deposits to the south. Also, some of the recharge to them is probably coming from the delta deposits near the valley walls. An evaluation of the possible recharge and the available drawdown indicates a maximum perennial yield of 3 to 4 mgd.

Overlying the lower aquifer in the northern part of the valley is another sand and gravel deposit at a depth of about 50 to 100 feet below land surface. This aquifer seems to be an extension of the delta deposits formed by the streams entering the valley along the east side. Therefore, the deposits receive a large amount of recharge from the streams crossing the deltas and could probably yield more than 4 mgd.

The thick and permeable delta deposits along the east side of the valley contain ground water under water-table conditions. Because of the large amount of stream recharge that is available to these deltas, they can probably yield at least 6 mgd on a perennial basis.

Thus the northern part of the Cayuga Inlet valley has a very large potential for ground-water development. Potentially, 8 mgd is available from the deeper aquifer and the part of the delta deposits under artesian conditions and 6 mgd from the delta deposits near the valley walls. If the delta deposits and the deeper aquifer are in hydraulic contact, the yield of the lower aquifer could be increased substantially at the expense of the upper one.

Catherine Creek valley.--Catherine Creek valley, at the south end of Seneca Lake, has a sequence of deposits similar to those in the Cayuga Inlet valley. One difference is that the outwash at the southern end of Catherine Creek valley is somewhat thicker and more permeable and has the potential for higher well yields than the outwash at the south end of Cayuga Inlet valley. Also the morainic and lake deposits in the central part of the valley seem to contain very few coarse zones. In fact, the difficulty in obtaining successful wells in the moraine area has been attributed to the quantity of fine-grained material.

The northern part of the valley, as in the Cayuga Inlet valley, contains very productive deposits of sand and gravel overlain by silt and clay. Well 422052N0765102.1 taps one of these deposits about 256 feet below land surface. Supply wells of the village of Montour Falls tap shallower zones. Well 422120N0765030.2 (table 5), 52 feet deep, has a yield of 225 gpm and a specific capacity of 44 gpm per ft, which indicates a transmissibility of about 90,000 gpd per ft. The static water levels in these wells are about at land surface. This, together with geologic evidence obtained from other wells in the vicinity (pl. 1B) indicates that the deposits tapped are recharged through the delta deposits along the valley walls. A maximum perennial yield of about 4 mgd would seem possible in the vicinity of Montour Falls. Near Seneca Lake, the deposits seem to be finer grained than those near Montour Falls and have lower well yields and perennial yields.

Keuka Inlet valley.--This valley is short but contains some of the most productive sand and gravel deposits in the basin. The outwash and kame material in the extreme southern end of the valley seems to be thick and to have both a large storage capacity and a high perennial yield. Discharge from part of these deposits appears as springs along Keuka Inlet. The flow of several

of these springs is collected and piped to the New York State Fish Hatchery about 3 miles west of Hammondsport. The sustained yield of the springs is reported to be about 1,300 gpm. Because these springs do not represent all the water being drained from the deposits underlying Keuka Inlet valley, their yields are only an indication of the large amount of ground water available.

In the northern part of the valley, as in the other valleys previously discussed, very permeable layers of sand and gravel are overlain by lake deposits. Several very high yielding wells have been developed in these deposits by the large wineries located in the valley. Total withdrawal from these wells exceeds 1 mgd during the grape harvesting and pressing seasons. Well 422338N0771528.2 is reported to have a yield of 400 gpm from a depth of 100 feet. The well is reported to have a natural flow of 150 gpm at land surface with a static water level of 38 feet above land surface. The deposits tapped by wells at the wineries are probably recharged from the deposits to the south. Water-bearing deposits farther north in the valley seem to be extensions of large deltaic deposits that were built in the valley by streams entering from both sides and were later covered by silt and clay. Because of the high transmissibilities and large drawdowns available, the deposits in the northern part of the valley could probably yield about 6 mgd.

Naples Creek and West River valleys.--The hydrology of these valleys is somewhat different from those previously discussed. Although Naples Creek valley has an outwash plain in its southern section, the middle part of the valley is composed mainly of thin till and lake deposits. In fact, bedrock is exposed in one of the small tributary streams in the center of the valley. Therefore, most of the wells drilled in this area have to enter bedrock to obtain sufficient yields for domestic uses.

The northernmost part of Naples Creek valley could be very productive. Although well data are scarce and no large-yielding wells have been drilled in the area, hydrologic data indicate that the area could yield substantial quantities of water. Logs of wells 423735N0772328.1 and 423837N0772220.1 (table 7) indicate that yields of at least, and probably much greater than, 500 gpm to individual wells could be developed. Recharge to the deposits is through the surficial deposits near Naples and through the deltaic deposits along the valley walls. A maximum perennial yield of 6 mgd seems reasonable for the area.

West River valley, which is tributary to Naples Creek valley, contains no important sources of ground water. The valley contains great thicknesses of silt and clay with a few thin layers of sand and gravel. Some wells in the valley have yielded more than 50 gpm, but this seems to be about the maximum yield that can be expected.

Flint Creek valley and Guyanoga valley.--These two valleys contain unconsolidated deposits comparable in thickness to those of the lake valleys. Flint Creek has a mass of morainic material at the southern end that yields moderate amounts of water to wells. The deposits are thin near well 423602N0771918.1 where bedrock occurs a few feet below the surface. North of this well the unconsolidated deposits are more than 100 feet thick in many places. Most of the valley floor is covered by lake deposits overlying the principal water-bearing deposits. A fence diagram of the valley-fill deposits in the Flint Creek valley near Potter is presented in figure 24. The southernmost

section shown in figure 24 consists almost entirely of lake deposits and contains little, if any, permeable material. The next section down the valley has many layers or lenses of sand and sand and gravel derived from a small recessional moraine in the area. Still farther north, at Potter, there is a considerable thickness of coarse-grained material underlying the silt and clay; this material is undoubtedly an extension of the delta of the small stream entering the valley at that point. Substantial quantities of ground water could probably be developed throughout the Flint Creek valley as far north as Gorham (pl. 1) from these coarse-grained deposits. The deposits are recharged through deltaic deposits along the valley walls, through morainic areas along the valley walls, and by infiltration through the silt and the clay. The greatest thickness and highest yields would probably come from those areas adjacent to deltaic deposits.

Nettle Creek valley, which enters Flint Creek valley east of Potter, is blocked at its south end by a moraine deposit of predominantly coarse-grained material and is underlain by coarse-grained outwash and kame deposits. Section E-E' in figure 23 shows the deposits of the northernmost reach of the valley where sand and gravel is overlain by thin lake deposits. The coarse-grained deposits farther south in the valley are relatively thick and occur on the surface, where they are readily recharged.

Guyanoga valley, similar to the northern part of Fall Creek valley, contains Sugar Creek, which flows southward into West Branch Keuka Lake near Branchport. The deposits on the valley floor tend to be fairly thick and permeable and in good hydraulic contact with the stream in the valley. Because of the good hydraulic contact and permeability, at least 6 mgd can be withdrawn from the deposits in the lower part of the valley (pl. 3). The extreme southern end of the valley does not seem to contain any significant coarse-grained material and therefore, is shown in plate 3 as having a much lower perennial yield than the area immediately to the north.

Deltaic deposits.--As previously mentioned, the deltaic deposits are extremely large sources of ground water. These deposits range in surface area from only a few hundred square feet to about a quarter of a square mile. Only the larger deltas are shown in plates 2 and 3.

Because water is easily obtained from most of the deltas, shallow wells are common and little subsurface data are available on the deeper parts of the deposits. Considerable hydrologic information is available, however, on the delta at the mouth of Kashong Creek, south of Geneva, where several test wells were drilled for the town of Seneca. A section through this deposit, based on these test wells, is shown as G-G' in figure 23. The deposit contains a considerable quantity of fine-grained material, as would be expected of a lake deposit. However, some very coarse zones are in hydraulic contact with the lake. Well 424553N0765820.1 (table 5) was pumped at the rate of 420 gpm with a drawdown of only 1.6 feet; these data indicate a deposit with very high transmissibility and good hydraulic connection with the lake. High-capacity test wells have been drilled on other deltas in the Western Oswego River basin, most notably on Frontenac Point in Cayuga Lake, where a yield of 900 gpm was reported from one test well.

Assuming that all the deltas in the area contain deposits with a permeability similar to those at Kashong Point, one well yielding about 1,000 gpm

could probably be developed for each 150 feet of delta shoreline. When applied to the delta of Kashong Creek, this indicates a yield of about 25 mgd for the deposit.

One may ask why the deltaic deposits should be developed when it would be easier simply to run a pipeline to the lake. The principal reasons are that the deposit would act as a natural filter, would eliminate the need for a costly filtration plant, and would reduce the amount of disinfection of the water that would be needed otherwise.

Other sand and gravel deposits.--Several other deposits of sand and gravel that provide fair to good supplies of ground water are shown in plates 2 and 3. Although it is not practical to discuss all of them in detail, some general discussion is desirable.

The large stream valleys of Mud and Salmon Creeks both contain deposits of sand and gravel that are in hydraulic contact with the streams. However, the deposits are generally thin and do not provide large perennial yields. Some individual areas in Salmon Creek valley provide substantial yields; for example the area around well 424025N0763210.1 near Genoa. Also, some deeper zones in the deposits of Mud Creek, especially where deltas have been formed by tributary streams, may provide larger supplies of water than the thin sand and gravel deposits supply.

Areas near the northern ends of Canandaigua and Keuka Lakes also may be capable of providing substantial quantities of ground water. For example, well 425239N0771619.1 at Canandaigua yields 140 gpm. Chances are excellent that the deposit tapped by this well is in hydraulic contact with Canadaigua Lake and that a fairly high perennial yield could be obtained. Similar conditions seem to prevail at Penn Yan where well 423923N0770330.1 has a reported yield of 230 gpm.

Several of the upland valley areas also have promising areas for small future development, most notably the areas east of Odessa, east of Burdett, and near Slaterville Springs. All these areas have fairly thick deposits of sand and gravel with some recharge from streamflow.

Other deposits of sand and gravel are scattered throughout the uplands. One of the largest is the outwash deposit in the vicinity of Dundee (section F-F' in fig. 23.), which is composed of sand and gravel interbedded with lake deposits. Some of the sands and gravels are very permeable as shown by well 423147N0765819.1, which has a yield of 200 gpm and a specific capacity of 69 gpm per ft. This indicates a transmissibility of more than 100,000 gpd per ft. However, the thickness of the deposit at the well is only 21 feet. Furthermore, most of the more permeable parts of the deposit are perched on the hillside and tend to drain readily. In fact, the village of Himrod utilizes a large spring supplied by drainage from the northern part of these deposits. Because perennial yields from the deposit tend to be low, the village of Dundee has experienced difficulty in obtaining an adequate yield from its well during summer and winter.

The outwash deposit has proved susceptable to artificial recharge from a small stream that passes over the deposit near the Dundee well field. The bottom and the sides of the stream channel are lined with fine-grained alluvium

that prevents the water from infiltrating the deposit. Only when the stream overflows its banks, does water move into the deposit. However, the stream has been dammed on occasion so that it would overflow its banks at lower flows and thereby recharge the sand and gravel deposit. Such a method may prove effective for similar deposits throughout the Western Oswego River basin. (See section, "Artificial Recharge.")

Other small sand and gravel deposits with small areas and thin saturated zones may be developed, but the best chance of obtaining water from many of them is by tapping the underlying bedrock. Because the deposits hold some water in storage during certain periods of the year, recharge to the bedrock is increased slightly. Also, it may be possible to drain some of the water from the saturated zones through the space between the bottom of the well casing and the bedrock. (See section, "Types of Well Construction.") For these reasons, well yields may be higher in areas overlain by sand and gravel than in areas where only till or lake deposits overlie the bedrock.

Bedrock

In areas shown as bedrock overlain by till in plate 2, water supplies sufficient for a home or farm supply are usually obtainable. However, the success of any well usually depends on the number of fractures in the bedrock that the well penetrates and on the rate at which these fractures can transmit water. In areas where the bedrock has a very low permeability, many drilled wells have been unsuccessful.

The bedrock is most permeable near the land surface, and the chances of tapping permeable zones below a depth of about 300 feet are not good. Most successful bedrock wells are less than 200 feet deep, and many are less than 100 feet deep. The best areas for developing a bedrock well are in the bottoms of upland valleys and in other low-lying areas in the uplands. Because of the low recharge rates, perennial yields in the uplands are generally low.

DEVELOPING GROUND-WATER SUPPLIES

Methods of developing ground-water supplies and ways in which the maximum yield may be obtained by careful consideration of such factors as well construction, well-site selection, and artificial ground-water recharge are subjects of this section.

Types of Well Construction

The amount of water and the reliability of the supply obtained from any ground-water source is largely determined by the type of well used to obtain the water. The type of well best suited to develop any aquifer depends on factors such as aquifer composition, amount of water required, and cost of construction. For these reasons, several different types of well construction are used in the Western Oswego River basin. The most common types are drilled, dug, and driven. Examples of these three types of wells are illustrated in figure 25.

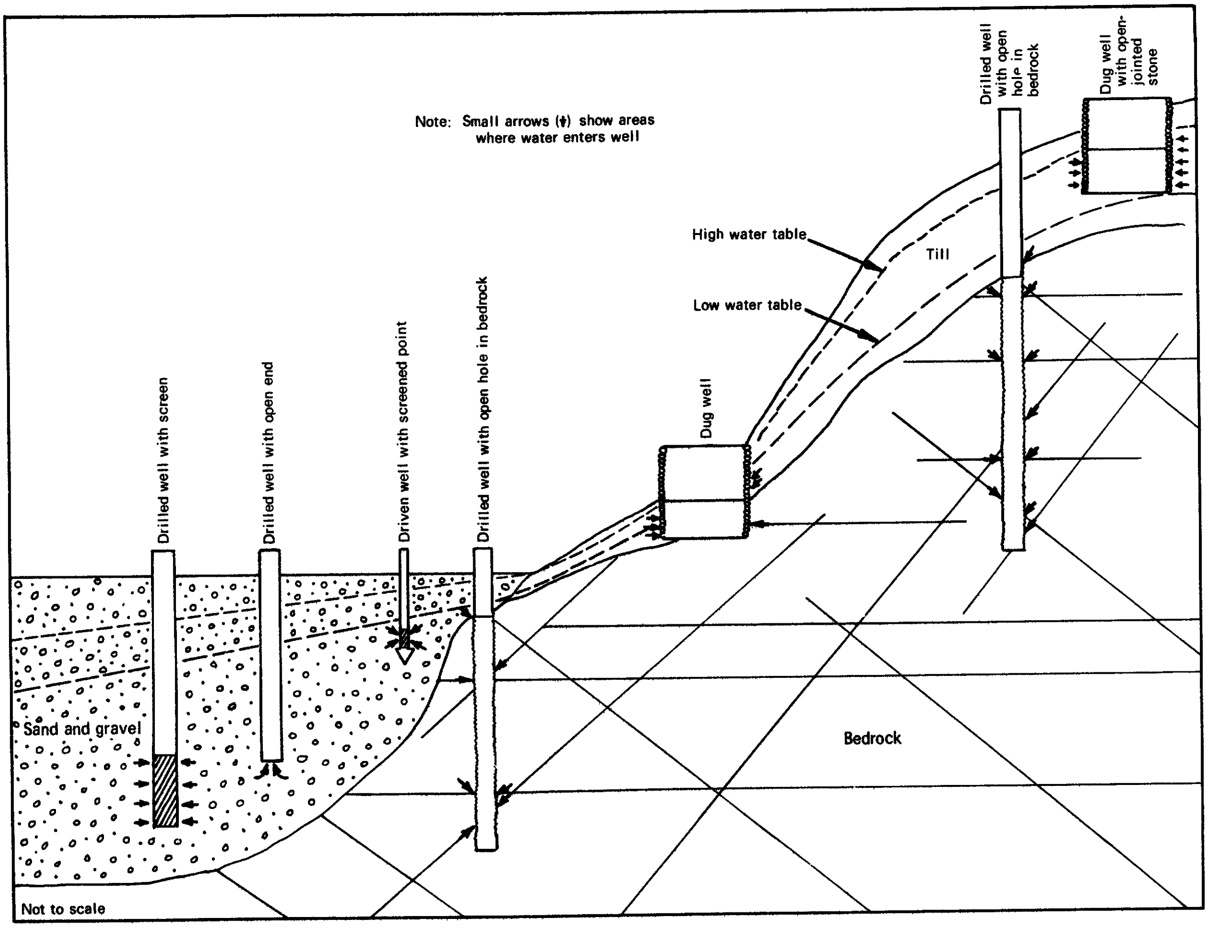


Figure 25.--Different types of well construction.

Drilled Wells

By far the largest percentage of wells being constructed in the basin are drilled wells produced by excavating a hole with either a cable tool or rotary drilling machine. With the cable tool, the hole is drilled by alternately raising and dropping a heavy tool that breaks up the rock or unconsolidated deposits. At frequent intervals, the debris is bailed from the hole. With the rotary drilling method, the hole is drilled by a revolving bit that cuts through the earth. The debris is continuously flushed from the hole with mud, in the case of the hydraulic rotary, or with air, in the case of the air rotary.

Usually the hole is kept open by the installing of a steel well casing as the hole progresses through unconsolidated deposits. These casings are generally 5 or 6 inches in diameter for domestic wells and may be more than 18 inches in diameter for large public supply wells.

The drilled well may be finished in any one of several ways, depending on the types of materials penetrated and the required supply. Most wells from which domestic or other small supplies are required are constructed simply. In unconsolidated deposits, they are cased full length; and the end of the casing is left open to admit water. In bedrock, they are cased to the bedrock surface; and an open hole is drilled into the bedrock (fig. 25). Generally, a well ending in bedrock is cased only to the top of the rock because the bedrock is strong enough to hold the hole open. (This may not be true in some solution-weakened rocks such as the Camillus Shale.) Water enters the well through the numerous fractures and joints in the rock. Where the bedrock is overlain by coarse-grained material, some water may also leak into the well around the end of the casing (fig. 25).

Where large amounts of water (industrial or public supplies) are required, drilled wells must be finished so that the maximum amount of water can enter the well. Installation of well screen is the most common method of finishing a well. The screen is a device for screening out most of the grains of sand and gravel while allowing water to enter the well. The size of the openings in the screen are selected on the basis of the size of the grains in the water-bearing deposit. The screen is usually about the same diameter as the well casing, ranges from a few feet to several tens of feet in length, and is attached to the bottom of the well casing (fig. 25). A properly screened well in a permeable sand and gravel deposit may yield hundreds or even thousands of gallons per minute.

The advantages of drilled wells in comparison with other wells are that they allow better development of coarse-grained deposits, allow deeper water-bearing deposits to be tapped, and, if constructed properly, are effective in sealing the upper portion of the well against pollution. Disadvantages are that they are ineffective in deposits with low permeability and are relatively expensive to construct.

Dug Wells

Dug wells are one of the most common types of wells in the basin, although few of them are being constructed now. They are constructed by digging a hole, either by hand of with a backhoe, and then shoring it with stone, brick, or

porous tile. Some wells may be dug into bedrock for a few feet. Although dug wells are usually less than 25 feet deep, their diameters are large, most at least 24 inches and some as much as 48 inches or more.

Dug wells are unique in that they can obtain sufficient water from materials, such as till, that have a low permeability. Because of the "open" casing and the large inside diameter, a large area of water-bearing material is exposed to the well and the well has a large storage capacity. Water is stored in the well to meet periods of heavy demand and this water can then be replenished overnight or during periods of no pumping. Because of the large amount of storage in the well, even a continuous yield of less than one-fourth gpm might be sufficient for household use.

The advantages of dug wells are that they are inexpensive to construct and can obtain water from aquifers of low permeability. However, dug wells may fail to supply enough water to households when demands are greater than average. Also, because most dug wells are shallow and only excavated a few feet below the water table, they are susceptible to small fluctuations of the water table and tend to go dry, especially near hilltops and on hillsides where water-table fluctuations are large. Because of their shallow depths and large surface exposures, dug wells are also more susceptible to pollution than other types of wells.

Driven Wells

Driven wells are the simplest and cheapest types of wells to install. The wells are constructed by driving lengths of pipe, usually about 1¼ inches in diameter, with a screened drive point attached, into shallow unconsolidated deposits. The point is driven down until it is below the water table.

Because of the ease in installing a driven well, one might expect that they would be much more common than they are. However, they are successful only in areas where permeable water-bearing materials lie at a shallow depth. Because driving becomes increasingly difficult with depth, most driven wells are less than 25 feet deep.

The advantage of driven wells is their inexpensive construction. Disadvantages are that the wells must be equipped with suction pumps, which limits pumping lifts to about 25 feet; also, the small casing diameter does not allow significant storage in the wells, and yields tend to be small.

Well Depth and Site Selection

Location and depth of any well tapping a water-bearing deposit have a great bearing on the amount of water that may be obtained. Maximum well yields of the various aquifers in the region given in plate 2 are valid only for properly located and designed wells.

Proper depth for a well is usually simple and logical to determine. For example, for maximum yield, a well tapping a 100-foot thick sand and gravel aquifer should be screened the full thickness or at least through the bottom part of the aquifer. This allows maximum drawdown and, therefore, maximum yield. In some wells, where the permeability of a formation decreases with

depth (almost always the case with bedrock) or where a smaller yield or less costly well is desired, this rule should not be followed.

Although the depth needed to finish a well is usually obvious, the proper site to drill the well may not be. Two of the most common mistakes in drilling wells are: (1) locating the well too close to the boundary of the aquifer, and (2) locating the well too close to another pumping well.

In plate 2, well yields are shown for aquifers. The reader may misinterpret this to mean that wells placed along the margin of the aquifer can obtain the maximum yields. However, this is usually not the case. As any well is pumped, the water level in it drops and a gradient is established towards the well as additional water is delivered. Under ideal conditions this depression of the water level around the well takes on the shape of an inverted cone and is termed the "cone of depression" (fig. 26A). However, if the well is near an impermeable boundary of the aquifer, very little water moves toward the well from that direction; so most of the water pumped must reach the well from the other sides of the cone. According to Darcy's law, the smaller the area through which a given amount of ground water moves, the steeper the gradient. (The permeability of earth materials does not change.) Therefore, the gradient on the sides of a cone of depression farthest from the boundary of the aquifer must be steeper and drawdown at the well greater, than if the same amount of water were pumped and the well were not affected by boundaries (fig. 26B).

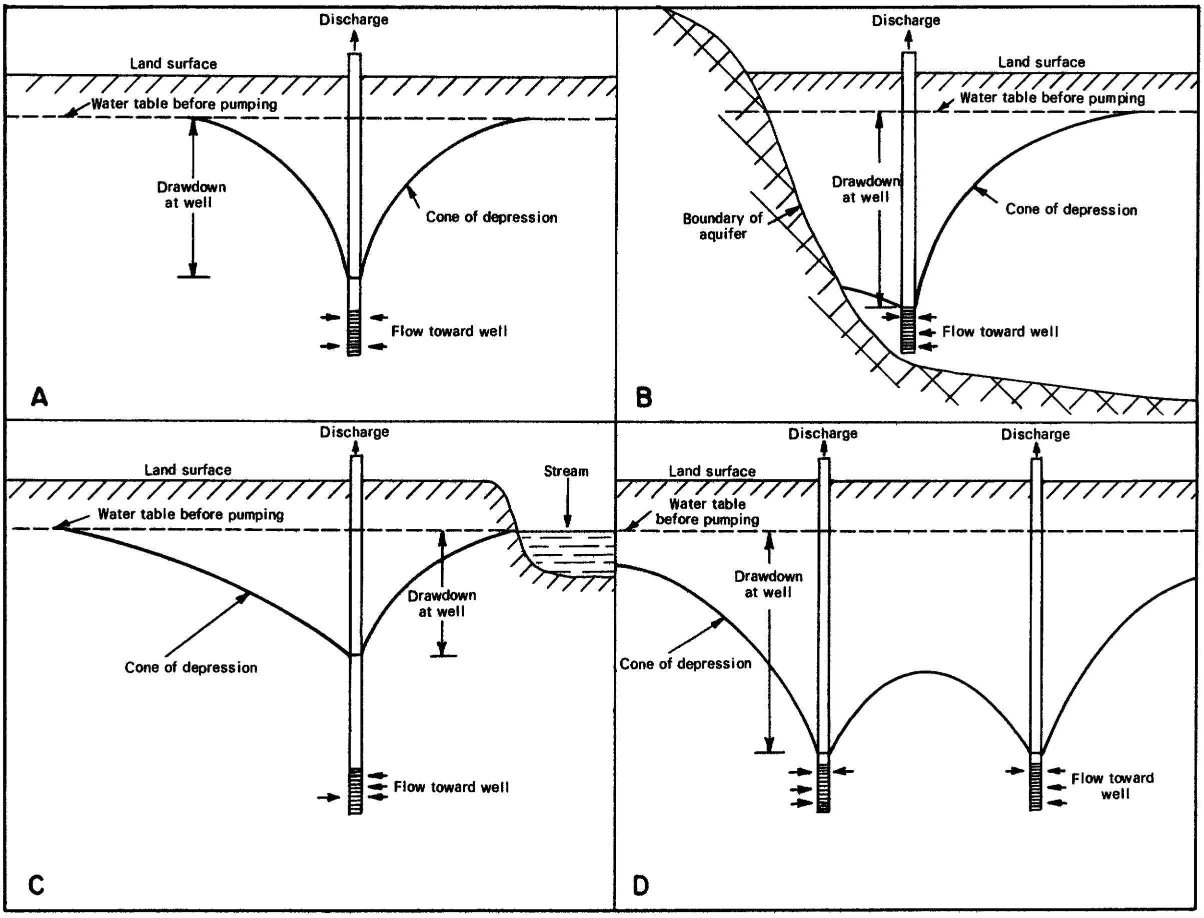


Figure 26.--Effects of well location on well yields.

Accordingly, the maximum yield of any well near the edge of the aquifer will be much lower than one near the center, and this fact should be considered when planning aquifer development.

For a water-table aquifer, a yield even greater than that obtainable near the center of the valley may be achieved by locating the well near a perennial stream where water can be induced into the aquifer. This would have the opposite effect on the drawdown and the shape of the cone of depression from that caused by locating a well too close to the boundary of the aquifer. In this case, the induced recharge from the stream would act as a "limitless" supply of water that would halt expansion of the cone of depression (fig. 26C). Therefore, drawdown would be less at each pumping rate, and the yield of the well could be increased greatly.

The other case of a poorly selected well site is that of two or more wells placed too close to one another. In this case, the cones of depression of the pumping wells would interfere with each other (fig. 26D). The effect is much the same as that resulting from a well located too close to the boundary of the aquifer. Because the amount of water moving toward the well would be decreased on the side bounded by another pumping well, more water must be brought from the other side. Thus, the drawdown would increase, and the yield would decrease. In large well fields, well interference cannot be avoided; however, it should be minimized by keeping the wells as far apart as practical. In wells with lower pumping rates, such as those for homes, well interference is usually not a significant problem. However, it may be noticeable in large housing developments.

The decision of where to locate a well may be based on factors other than maximum possible yield. For example, a homeowner would need only a small amount of water. His selection of a site would be limited to the area of his lot.

Artificial Recharge

Artificial recharge of aquifers is not a very widespread practice in the eastern United States, though the practice on Long Island is a notable exception. As increasing demands are made on the ground-water resources of the area, the practice will undoubtedly grow.

A distinction should be made between artificial recharge and induced recharge. Induced recharge refers to the additional water that infiltrates an aquifer adjacent to a stream or lake when the water table is lowered by pumping. Artificial recharge is the recharge of water that would not normally be available to an aquifer through pumping. Storage of streamflow on the land surface and eventual release of the water to an adjacent aquifer at a time when the streamflow would not usually be sufficient to supply recharge is probably the method of artificial recharge best suited to the Western Oswego River basin. This method is feasible because most of the large ground-water aquifers are in the valley bottoms, and it may be possible to build small storage reservoirs in the uplands to store the large volumes of runoff that normally occur in the spring. Then, during the summer, when streamflow would normally be very low or nonexistent, this water would be released to supplement streamflow and increase the infiltration to the aquifers.

If one must go to the trouble and the expense of building storage reservoirs, the reader may wonder why not use all the stored water directly rather than run it into a stream so part of it can infiltrate. This is a possibility and might be the better choice, depending on the location of water demand. However, as previously discussed, ground-water supplies have certain advantages over surface-water supplies. The prinicpal savings are in treatment costs because ground water does not usually need treatment to remove suspended material or filterable pollutants and is generally of much higher and consistent sanitary quality than stream water. Furthermore, augmenting streamflow from storage reservoirs may have other benefits in addition to increasing induced recharge.

In some places in the basin, streams are adjacent to aquifers but are not sources of recharge because thin impermeable deposits in the streambeds separate the stream water and the aquifer. In these places, the impermeable material may be removed by excavation; or flow of the stream may be directed beyond the area of impermeable material and onto permeable material through which the aquifer can be recharged. Such hydrologic situations are common in many areas of the basin because of the normal silting of stream channels in reaches with low gradients.

SUMMARY AND CONCLUSIONS

The Western Oswego River basin encompasses an area of about 2,600 square miles in central New York and includes the drainage basins of the four largest Finger Lakes--Cayuga, Seneca, Keuka, and Canandaigua. The northern part of the basin consists of a rather low-lying plain superimposed with numerous drumlins and drumlin-shaped hills. The southern half of the basin is dominated by the long, deep valleys of the four Finger Lakes. Hills and uplands between these lakes, and to the south of them, rise to altitudes of more than 2,000 feet or about 1,700 feet above both the lowland in the north and the water surfaces of the two largest lakes.

Bedrock underlying the southern half of the area consists of a series of shale, siltstone, and sandstone layers of Devonian age. The northern half of the area is underlain from south to north by Devonian limestone, and Silurian limestone, shale, and dolomite. The Silurian shale contains a large amount of interbedded salt and gypsum. All the bedrock units dip to the south at an average rate of 50 feet per mile. In the southern half of the basin, the rocks have been slightly folded and faulted.

Almost all the unconsolidated deposits in the basin owe their origin, either directly or indirectly, to the glaciation of the area. In the northern part of the area, the most striking deposits are the drumlins, which are composed of glacial till. Large, thin deposits of glacial outwash are found between many of the drumlins. Lake deposits are extensive, especially north of Cayuga and Seneca Lakes. Most of the glacial deposits in the southern part of the basin are confined to the large valleys where sand and gravel deposits and lake deposits may total several hundred feet in thickness. Other widespread unconsolidated deposits are represented by the deltas, both those presently being formed in the lakes and those high on the valley walls as remnants of higher lake levels during the retreat of the last ice sheet.

Precipitation in the area ranges from less than 30 inches in the northwest to more than 40 inches at higher altitudes in the southeast. Evapotranspiration consumes about two-thirds of the precipitation in the northern part of the basin and about one-half at the higher altitudes in the south. Precipitation surplus, the water available for ground-water recharge and overland runoff, ranges from 8 inches in the north to 20 inches in the south. Direct ground-water recharge from precipitation is estimated to range from 20 million gallons per year per square mile for the areas underlain by glacial till to 262 million gallons per year per square mile for areas underlain by sand and gravel in the south. Rates of ground-water recharge are much higher in areas where overland runoff is discharged from till areas to coarse-grained deposits.

The lower flows in the streams in the basin were found to be directly related to the percentage of coarse-grained deposits in their drainage basins. Direct ground-water discharge to the lakes in the basin does not show up at the land surface, where it might be measured. Such discharge was computed to average 6.5 mgd (10 cubic feet per second) to Seneca and Cayuga Lakes and less than half that amount for the other two lakes in the basin.

Nine to 12 mgd of ground water is used in the basin, and several times this amount is available for future development, particularly from areas south of the four largest Finger Lakes and from certain areas along the Barge Canal.

Ground water is available throughout the basin in quantities generally sufficient for domestic and farm supplies and in many areas in quantities sufficient for municipal and industrial supplies. In the northern part of the basin, the most important sources of ground water are deposits of sand and gravel along the Barge Canal. In areas where these deposits are adjacent to the canal and where water may be induced into the deposits from the canal, yields of more than 1,000 gpm are obtained and perennial yields of 2 to more than 4 million gallons per day per square mile of aquifer are possible. In the bedrock in the northern half of the basin, yields of up to 1,000 gpm for the shales containing soluble rocks and 400 gpm for the carbonate rocks have been reported. Again, perennial yields are greatest where the bedrock is in hydraulic contact with perennial streams or is overlain by large deposits of sand and gravel. The areas where the bedrock has the greatest perennial yields (several million gallons per day) are along the valleys of the Barge Canal and the Seneca River.

The principal aquifers in the southern half of the basin are sand and gravel deposits in the large valleys, where well yields of more than 1,000 gpm are possible. Parts of the valleys of Fall Creek and Sugar Creek (Guyanoga Valley), where streams are in hydraulic contact with aquifers, have potential yields of several million gallons per day. The stream valleys at the southern ends of all of the four Finger Lakes have a similar sequence of water-bearing deposits: (1) outwash plains at the southernmost extreme, (2) morainic deposits that are largely fine grained in the middle sections of the valley, and (3) lake deposits overlying layers of sand and gravel in the northernmost parts of the valleys. The most productive deposits are at the northern ends of the valleys near Ithaca, Montour Falls, Hammondsport, and Naples. Artesian aquifers of sand and gravel in these areas are recharged through moraine and deltaic deposits in the valleys and can usually yield from 2 to more than 4 million gallons per day per square mile of aquifer area.

The deltaic deposits in the four Finger Lakes represent a special type of ground-water aquifer because of their hydraulic connections with almost unlimited quantities of lake water. Yields from several of the larger deltaic deposits would be in the tens of millions of gallons per day.

Maximum yields of many of the aquifers depend on the type of well construction and the proper selection of well location and spacing. Several of the aquifers in the area would also be susceptible to increasing their yields through artificial recharge by (1) the storage and release of streamflow to various aquifers, and (2) the removal or the bypassing of impermeable material in streambeds overlying or adjacent to aquifers.

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Table 5.--Records of selected wells and test holes in the Western Oswego River basin

Well number and location: See "Well-Numbering System" in text for explanation.

Owner or name: Either name of owner of well or name by which well is referenced.

Method drilled:
- A Air rotary
- B Bored or auger
- C Cable-tool
- D Dug
- H Hydraulic rotary
- J Jetted
- V Driven
- W Drive-wash
- Z Other

Well use:
- O Observation
- P Oil or gas
- T Test hole
- U Unused
- W Withdraw water
- Z Destroyed

Note: Most test holes have also been destroyed.

Water use:
- A Air conditioning
- B Bottling
- C Commercial
- F Fire protection
- H Domestic
- I Irrigation
- N Industrial
- P Public supply
- S Stock supply
- T Institutional
- U Unused
- Z Other

Note: Refers to principal use of water. Many wells have multiple uses.

Well depth: All depths below land surface.

Casing depth: All depths below land surface.

Casing diameter: Diameters of dug wells are approximate. Where two or more sizes of casing were used, the smallest diameter is given.

Well finish:
- C Porous concrete or tile
- G Screened and gravel-packed
- O Open end
- P Perforated or slotted casing
- S Screen
- T Sand or well point
- W Walled or shored
- X Open hole
- Z Other

Altitude of LSD: Altitude, in feet above mean sea level, of land-surface datum at well.

Depth to consolidated rock: All depths below land surface.

Water-bearing material: The principal water-bearing material contributing water to the well, even though several other water-bearing materials may be present. With respect to test holes, this refers to the principal water-bearing material penetrated by the hole, which may not be compatible with the final depth or length of casing in the hole.

Formation: This refers to the geologic name of the bedrock formation contributing the most water to the well, if bedrock is the principal water-bearing material. See section of report on bedrock geology and figures 5-7 for information on the different formations.

Silurian Carbonate Rock - Refers to the Akron Dolomite, Cobleskill Limestone, and Bertie Limestone, which are too thin to differentiate on the basis of well logs.

Water level: All water levels below land surface except those preceded by a plus (+) sign which are above land surface.

F Water level is above land surface (well flows)

Yield (method determined):
- 1 Volumetric
- 3 Bailer

Note: If column is blank, the yield is reported or the method of determination is unknown.

Log available: Log in this report.
- D Log by driller
- G Log by geologist

QW type: Type of chemical-quality information available.
- C Complete chemical analysis
- J Specific conductance and chloride
- L Chloride
- M Complete and one or more partial analyses
- P Partial analysis

Remarks:
- H_2S - Noticeable odor of hydrogen sulfide (sulfur water)
- Gas - Well yields flammable gas (natural gas or methane)
- Iron - Water contains a relatively high iron content, and stains porcelain fixtures
- Salty - Water is salty to the taste
- GPM - Gallons per minute
- Specific capacity - Yield in gallons per minute, per foot of drawdown in the well

Table 5.--Records of selected wells and test holes in the Western Oswego River basin (Continued)

WELL NUMBER AND LOCATION	OWNER OR NAME	METHOD DRILLED	DATE DRILLED (YEAR)	WELL USE	WATER USE	WELL DEPTH (FT.)	CASING DEPTH (FT.)	CASING DIAMETER (IN.)	WELL FINISH	ALTITUDE OF LSD (FT.)
421140N0764851.1	D BAYLOR	C	1950	W	H	44	44	6	O	950
421154N0765024.1	TRAVELERS INN	C	1953	U	U	120	120	5	O	910
421211N0765030.1	J SOPP	C	1953	W	H	98	85	6	X	930
421258N0765053.1	HICKORY HOUSE	C	1961	W	C	37	32	6	S	910
421306N0765050.1	L THRASHER	C	1953	W	H	96	85	6	X	920
421321N0765052.1	G WEST	C	--	W	C	205	205	6	O	920
421357N0764925.1	W DAWSON	C	1951	W	H	56	56	6	O	980
421558N0764944.1	J RADCLIFFE	C	1952	U	U	245	245	6	O	900
421603N0765008.1	R SEAGER	C	--	W	P	90	90	6	O	700
421655N0764803.1	UNKNOWN	C	1965	U	H	116	56	5	X	1410
421658N0763109.1	C MACKAY	C	1950	W	H	87	84	8	X	1120
421807N0763113.1	L THOMAS	C	1949	W	H	189	189	6	O	980
421819N0765352.1	MORELAND SCHOOL	C	1935	U	U	70	35	6	X	1120
421829N0765107.1	S CASSELBERRY	V	1965	W	I	16	14	1½	T	550
421836N0764326.1	C ELDRIDGE	C	1965	W	H	21	21	6	O	1160
421837N0764324.1	W FARARY	C	1965	W	H	27	27	6	O	1160
421837N0765725.1	R COOPER	C	--	W	H	26	26	6	O	1230
421846N0764653.1	M HAYES	C	1947	--	--	48	48	6	O	1180
421849N0765504.1	BARRETT	C	--	U	U	200	60	6	X	1180
421854N0764810.1	F HAYES	C	1937	--	--	48	48	6	O	1070
421904N0763134.1	HUTTUNEN	C	--	U	U	40	40	6	O	950
421910N0763122.1	MRS HINDS	C	1955	W	H	144	144	6	O	930
421923N0764706.1	S DURFER	C	1946	W	H	55	55	6	O	1060
421938N0764901.1	M CONKLIN	C	1947	W	H	164	164	4	O	950
421944N0765029.1	P NIVER	V	--	U	U	18	16	1½	T	490
421957N0764731.1	PAYNE	C	1932	--	--	40	40	6	O	1050
422004N0764733.1	ODESSA C SCHOOL	C	--	W	T	19	19	9	O	1050
422004N0765013.1	A VALENTI	C	1946	Z	U	229	--	6	O	475
422006N0763409.1	UNKNOWN	C	1965	W	H	100	23	6	X	1395
422013N0763743.1	O FREJCA	C	1961	W	H	206	25	6	X	1210
422013N0763743.2	O FREJCA	C	1935	W	H	67	25	6	X	1210
422019N0764800.1	COTTON-HANLON	C	--	W	S	43	43	6	O	1021
422030N0765310.1	H BARRET	C	1932	--	--	100	94	6	X	1120
422035N0763800.1	J GALE	D	--	W	H	13	--	24	W	1200
422042N0763151.1	A WESTMILLER	C	1966	W	H	123	123	5	O	870
422048N0763159.1	D HUNTER	C	1965	W	H	128	128	6	O	800
422049N0763217.1	L HUNTER	C	1965	W	H	15	15	6	O	710
422050N0763022.1	E STROBEL	C	1966	W	H	144	58	5	X	1225
422052N0765102.1	SHEPHARD NILES C	C	1937	W	N	265	265	6	O	450
422053N0763228.1	E PAKKALA	C	1962	W	H	149	149	5	O	670
422053N0765032.1	MONTOUR FALLS	C	--	U	U	26	26	6	X	450
422054N0765031.1	MONTOUR FALLS	C	1941	W	P	62	57	6	S	455
422054N0765033.1	MONTOUR FALLS	C	1941	W	P	67	57	6	S	455
422055N0765030.1	MONTOUR FALLS	C	1941	O	U	52	52	6	S	455
422057N0765709.1	TOWNSEND SCHOOL	C	1931	U	U	54	54	6	O	1330
422058N0765658.1	G RAPALEE	C	1930	--	--	160	20	6	X	1340
422059N0763648.1	L TEETER	C	1964	W	H	50	50	5	O	1150
422106N0763640.1	F HARTMAN	C	1965	W	C	46	46	6	O	1170
422117N0763604.1	D COMSTOCK	C	1965	W	H	42	42	6	O	1155
422118N0765018.1	MONTOUR FALLS	C	1965	T	U	100	100	6	O	480
422120N0765030.1	MONTOUR FALLS	C	1965	T	U	60	60	6	O	455
422120N0765030.2	MONTOUR FALLS	C	1965	W	P	52	33	12	S	455
422121N0765017.1	MONTOUR FALLS	C	1965	T	U	40	35	6	X	480
422122N0763247.1	GEO ALLEN	C	1949	W	H	282	282	6	O	620
422125N0763515.1	M LAUGHLIN	C	1955	W	H	96	8	6	X	1145
422130N0762925.1	MILLER	C	1966	W	H	180	63	5	X	1240
422130N0762929.1	MILLER CONST	C	1966	W	H	45	45	5	O	1250
422153N0763402.1	J THOMPSON	C	1955	W	H	225	20	6	X	860
422154N0763343.1	J RAY	C	1964	U	U	81	81	5	O	650
422207N0771740.1	UNKNOWN	C	1966	W	H	45	45	6	O	1090
422211N0771703.1	NYSDPW	--	1952	T	U	80	--	2	--	1059
422215N0762400.1	J STEVEN	C	1965	W	H	105	105	5	O	970
422219N0762400.1	R MUNSON	C	1950	W	H	94	94	5	O	970
422220N0771708.1	NYS CONSER DEPT	C	--	W	Z	25	25	4	O	1020
422225N0764257.1	H WALTERMIRE	C	1965	W	H	66	21	6	X	1380
422226N0763323.1	E BURY	D	--	W	H	15	15	4	O	500
422229N0771646.1	I DAVENPORT HOS	C	1958	U	U	155	--	--	O	1100
422243N0762124.1	R BURGESS	C	1965	W	H	44	44	5	O	1155
422252N0762348.1	NYSDPW	--	1961	T	U	25	--	--	--	900
422252N0771709.1	G NORTHRUP	C	1956	W	H	72	72	6	O	1130
422253N0762334.1	FUDGER	C	1966	W	H	101	29	5	X	915
422256N0765706.1	T LOVE	C	--	--	--	45	45	6	O	1530
422303N0765123.1	NYSBSM	W	1966	T	U	98	--	2	O	445
422304N0763801.1	H GEORGE	C	1966	W	H	60	53	6	X	1370
422305N0765127.1	NYSDPW	W	1966	T	U	106	--	2	O	445
422305N0765519.1	NYSDPW	W	1966	T	U	118	--	2	O	445
422310N0762448.1	E CLARK	C	1958	W	H	146	146	5	O	870
422315N0763349.1	G VANDERMARK	C	1956	W	P	307	13	6	X	590
422317N0762448.1	MOREY	C	--	W	H	39	39	6	O	850
422321N0763340.1	G VANDERMARK	C	1945	W	P	56	56	6	O	530

DEPTH TO CONSL. ROCK (FT.)	WATER-BEARING MATERIAL	FORMATION	WATER LEVEL (FT.)	WATER LEVEL DATE MEAS.	YIELD (GPM)	YIELD (METHOD DETER-MINED)	LOG AVAIL-ABLE	QW TYPE	REMARKS
									--
--	SAND AND GRAVEL	--	39	--	9	--	D	--	--
--	SAND	--	0	--	--	--	D	--	--
83	SANDY SHALE	JAVA & WEST FALLS FM	10	--	5	--	D	--	SALT WATER IN BEDROCK
--	SAND AND GRAVEL	--	--	--	5	--	--	C	NAT. GAS
85	SANDY SHALE	JAVA & WEST FALLS FM	15	--	4	--	D	--	
--	SAND AND GRAVEL	--	30	--	35	3	--	--	SAND IN WATER
--	SAND AND GRAVEL	--	23	--	6	--	D	P	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	PRINCIPAL AQUIFER AT 21 FT
--	SAND	--	F	--	--	--	--	C	SALT WATER IN BEDROCK
56	SILTY SANDSTONE	JAVA & WEST FALLS FM	25	4-65	--	--	--	--	--
84	SHALE	JAVA & WEST FALLS FM	--	--	--	--	--	C	--
--	SAND AND GRAVEL	--	--	--	--	--	--	P	--
35	SHALE	SONYEA FM	F	--	7	--	--	--	--
--	SAND	--	3	4-66	--	--	--	--	--
--	SAND	--	18	-65	4	3		C	--
--	SAND AND GRAVEL	--	17	--	12	3	D	--	--
--	SAND	--	16	--	--	--	--	--	--
--	SAND AND GRAVEL	--	20	--	6	--	--	--	--
60	SHALE	SONYEA FM	F	--	--	--	--	--	--
--	SAND AND GRAVEL	--	23	--	--	--	--	--	--
--	SAND AND GRAVEL	--	39	--	--	--	--	--	WELL "DRY" DURING SUMMER, 1964
--	SAND	--	3	--	2	3	--	C	--
--	SAND	--	15	--	--	--	--	--	--
--	SAND	--	82	--	--	--	--	--	--
--	SAND AND GRAVEL	--	5	4-66	--	--	--	--	--
--	SAND AND GRAVEL	--	18	--	100	--	--	--	--
--	SAND AND GRAVEL	--	8	5-65	--	--	--	--	--
--	SILTY CLAY	--	--	--	--	--	D	--	WOOD IN CLAY FROM 220-229 FT
23	SANDY SHALE	GENESEE FM	17	7-65	4	3	D	--	--
25	SHALE	SONYEA FM	40	2-61	1	--	--	C	H_2S; WATER CONTAINS SEDIMENT
25	SHALE	SONYEA FM	25	8-66	--	--	--	--	--
--	SAND AND GRAVEL	--	15	--	--	--	--	--	--
94	SHALE	SONYEA FM	40	--	1	--	--	--	--
--	SAND AND GRAVEL	--	10	8-66	--	--	--	P	--
--	SAND AND GRAVEL	--	65	5-66	22	3	D	--	--
--	SAND AND GRAVEL	--	30	7-65	--	--	D	--	--
--	SAND AND GRAVEL	--	--	--	4	3	--	--	--
57	SHALE	SONYEA FM	12	8-66	8	3	D	--	--
--	SAND AND GRAVEL	--	F	--	--	--	--	C	--
--	SAND	--	F	--	--	--	--	--	SAND IN WATER
--	SAND AND GRAVEL	--	6	7-65	--	--	--	--	--
--	SAND AND GRAVEL	--	8	5-65	64	--	--	--	--
--	SAND AND GRAVEL	--	8	5-65	64	--	--	--	--
--	SAND AND GRAVEL	--	15	7-65	--	--	--	--	WELL PARTIALLY FILLED
--	SAND AND GRAVEL	--	13	--	6	--	--	--	--
20	SHALE	JAVA & WEST FALLS FM	30	--	3	--	--	--	--
--	SAND AND GRAVEL	--	48	--	--	--	--	P	--
--	SAND AND GRAVEL	--	15	--	30	3	--	--	--
--	SAND AND GRAVEL	--	--	--	4	3	D	--	--
--	CLAYEY GRAVEL	--	--	--	7	3	D	--	--
--	SAND AND GRAVEL	--	--	--	48	3	D	--	--
--	SAND AND GRAVEL	--	12	9-65	225	--	--	--	SPEC. CAPACITY 44 GPM/FT
35	COARSE GRAINED SAND	--	--	--	5	3	D	--	--
--	SAND AND GRAVEL	--	F	8-66	--	--	--	C	--
8	SHALE	GENESEE FM	10	-65	--	--	--	P	YIELD LESS THAN 1 GPM
57	SHALE	SONYEA FM	15	9-66	30	3	D	--	--
55	SAND AND GRAVEL	--	15	3-66	15	3	D	C	--
20	SHALE	GENESEE FM	--	--	--	--	--	P	--
--	SAND	--	--	10-65	--	--	--	--	--
--	SAND AND GRAVEL	--	26	9-66	70	3	--	--	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	2	11-65	--	--	--	--	H_2S
--	SAND AND GRAVEL	--	3	11-65	--	--	--	--	H_2S; SAND IN WATER
--	SAND AND GRAVEL	--	2	9-66	25	1	--	C	--
21	SHALE	SONYEA FM	F	7-66	12	--	D	--	--
--	SAND AND GRAVEL	--	6	10-65	5	--	--	--	--
--	CLAYEY SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	1	8-65	15	3	--	--	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	COARSE GRAINED SAND	--	--	--	--	--	D	--	--
29	SHALE	GENESEE FM	F	--	30	3	D	--	--
--	SAND AND GRAVEL	--	5	--	--	--	--	--	--
--	SAND	--	2	9-66	--	--	D	--	--
53	SHALE	SONYEA FM	--	--	7	3	--	--	--
--	SAND	--	1	9-66	--	--	D	--	--
--	SAND	--	1	10-66	--	--	D	--	--
--	SAND AND GRAVEL	--	F	--	--	--	--	--	H_2S; IRON
13	SHALE	GENESEE FM	--	--	30	--	D	--	SUPPLIES TRAILER PARK IN WINTER
--	SAND AND GRAVEL	--	1	11-65	--	--	--	--	--
--	SAND AND GRAVEL	--	--	--	20	--	--	--	SUPPLIES TRAILER PARK

Table 5.--Records of selected wells and test holes in the Western Oswego River basin (Continued)

WELL NUMBER AND LOCATION	OWNER OR NAME	METHOD DRILLED	DATE DRILLED (YEAR)	WELL USE	WATER USE	WELL DEPTH (FT.)	CASING DEPTH (FT.)	CASING DIAMETER (IN.)	WELL FINISH	ALTITUDE OF LSD (FT.)
422332N0762855.1	F MONROE	C	1966	W	H	109	--	6	X	1450
422333N0762043.1	CRISPELL CO	V	1960	W	C	45	45	1 1/4	T	1120
422334N0762217.1	CAROLINE SCHOOL	C	1961	W	T	42	42	6	O	1040
422336N0763809.1	L H HINE	C	1956	W	H	105	10	6	X	1400
422338N0771528.1	TAYLOR WINE CO	C	1945	W	N	107	98	8	G	790
422338N0771528.2	TAYLOR WINE CO	C	1949	W	N	100	90	12	G	790
422340N0762221.1	BRILL AUTO SALE	C	1966	W	C	20	20	6	O	1050
422340N0771513.1	PLEASANT VALLEY	C	1955	W	N	148	144	10	G	770
422342N0771530.1	PLEASANT VALLEY	Z	1955	T	U	120	120	2	O	780
422344N0762418.1	J MASON	C	1965	W	C	104	44	5	X	990
422344N0763243.1	ASHLAND OIL CO	C	1961	W	C	397	397	6	O	440
422345N0765804.1	R ELLISON	C	1930	U	U	120	50	6	X	1510
422346N0762516.1	NYSDPW	--	1966	T	U	56	--	--	--	820
422348N0762514.1	D UTTER	C	--	U	U	69	69	6	O	830
422349N0762354.1	J BRAWLEY	C	1965	W	H	206	28	6	X	1130
422352N0762448.1	D FURMAN	C	1955	U	U	95	73	5	X	900
422353N0762449.1	Q WILCOX	C	1957	W	U	95	60	6	X	900
422355N0762452.1	E NEWHART	C	1956	W	H	83	50	6	X	900
422355N0763840.1	J BROWN	C	1952	W	H	28	28	6	O	1460
422356N0771517.1	PLEASANT VALLEY	C	1955	T	U	151	131	8	O	720
422359N0762101.1	H R SCHUTT	C	--	W	H	100	100	6	O	1175
422401N0762624.1	D WRISLEY	C	1957	W	H	172	172	5	O	820
422402N0765702.1	J MASIN	C	1965	W	H	41	20	6	X	1570
422405N0765551.1	G HOUCK	C	1965	W	H	130	22	6	X	1330
422407N0762737.1	R GERE	C	1964	W	H	150	15	5	X	970
422409N0765840.1	J MEEHAN	C	1911	U	U	54	54	6	O	1580
422423N0763506.1	J L DONAR	C	1965	W	H	66	66	5	O	1070
422425N0771308.1	NYSDPW	W	1962	T	U	101	--	2	--	721
422426N0762559.1	R KELLOGG	C	1951	W	C	167	60	6	X	900
422430N0763228.1	GRAYHAVEN MOTEL	C	1955	W	C	320	320	6	O	440
422431N0763229.1	DUN ROVIN MOTEL	C	1954	W	C	290	290	6	O	430
422435N0763033.1	C BRASHIER	C	1966	W	H	270	12	6	X	965
422436N0763228.1	WONDERLAND MTL	C	1954	W	C	286	286	6	O	440
422440N0762250.1	T CAVENEY	C	1930	W	H	30	30	6	O	1100
422440N0763219.1	K MCQUIRE	C	--	W	H	363	363	6	O	440
422442N0762828.1	E BODINE	C	1964	W	H	100	22	5	X	930
422444N0762638.1	J HUNTINGTON	C	1965	W	H	235	67	6	X	900
422447N0763746.1	A HOOVER	C	1964	W	H	79	22	6	X	1140
422448N0763202.1	L WEAVER	C	1965	W	H	435	435	5	O	440
422450N0771402.1	R BACON	C	1956	W	H	51	50	6	X	1210
422451N0763157.1	DODD NURSING H	C	1945	W	T	420	420	6	O	440
422502N0765057.1	PRICE	C	1936	W	H	69	24	6	X	1000
422502N0765908.1	R RAPLEE	C	1965	W	S	74	35	6	X	1670
422513N0765412.1	C BROOME	C	--	U	U	148	31	6	X	850
422519N0764802.1	A BRAGEE	C	--	W	--	100	59	6	X	1180
422521N0764955.1	D LOVE	C	--	W	H	30	30	6	O	1120
422535N0764819.1	A WELCH	C	1966	W	H	60	60	6	O	1165
422538N0764814.1	F VANDRYER	C	1936	W	H	48	48	6	O	1160
422539N0764945.1	F KELLY	C	1963	W	H	38	38	5	O	1030
422540N0763638.1	ALBERT	C	1966	W	H	120	22	5	X	1450
422549N0763756.1	W SPENCER	C	1957	W	H	125	75	6	X	1120
422558N0762658.1	D WILLSEY	C	1954	W	H	105	15	6	O	1090
422558N0763100.1	SOUTH WELL	C	1903	T	U	232	--	--	--	385
422608N0763051.1	STRANG NO 2	--	1903	T	U	325	--	--	--	390
422609N0763053.1	MILLARD NO 2	C	1903	T	U	259	--	--	--	385
422610N0763031.1	NYSDPW	--	1960	T	U	130	--	--	--	390
422610N0763045.1	MILLARD NO 1	C	1903	T	U	304	--	--	O	385
422610N0763049.1	HOLMES WELL	C	1903	T	U	291	--	--	--	385
422610N0763049.2	TRAPP NO 1	C	1903	T	U	332	--	--	--	385
422610N0763052.1	CLINTON ST WELL	C	1903	T	U	280	--	--	--	385
422610N0763053.1	STRANG NO 1	C	1903	T	U	286	--	--	--	385
422611N0763046.1	STRANG NO 5	--	1903	T	U	276	--	--	--	385
422611N0763048.1	ILLSTON WELL	--	1894	Z	C	289	289	6	O	385
422611N0763050.1	MILLARD NO 3	C	1903	T	U	303	--	--	--	385
422612N0763048.1	ITHACA N Y	C	1903	T	U	280	--	--	O	385
422613N0763047.1	STRANG NO 4	--	1903	T	U	280	--	--	--	385
422622N0765601.1	C CONKLIN	C	--	W	S	70	10	6	X	1230
422623N0763752.1	ROGER MCFALL	C	1966	W	H	65	65	5	O	1110
422626N0763054.1	NYSDPW	--	1960	T	U	105	--	--	--	390
422639N0762626.1	H WHEELER	D	--	W	H	24	24	36	W	960
422641N0762609.1	F LOVELAND	C	1955	W	S	300	--	6	X	960
422656N0762358.1	R EASTMAN	C	1966	W	H	160	17	5	X	1530
422657N0764035.1	CORNISH	C	1966	W	H	205	101	5	X	1350
422657N0764052.1	R SCOFIELD	C	1956	W	H	63	3	6	X	1360
422700N0763458.1	N WOODKIRK	C	1966	W	H	162	31	5	X	1370
422701N0763459.1	H FISH	C	1966	W	H	105	30	5	X	1370
422702N0763016.1	NYSDPW	--	1960	T	U	102	--	--	--	390
422716N0764218.1	KELLY	C	1966	W	H	120	120	5	O	1210
422717N0763003.1	NYSDPW	--	1960	T	U	120	--	--	--	390
422718N0765155.1	UNKNOWN	C	1936	--	--	115	27	6	X	780

DEPTH TO CONSL. ROCK (FT.)	WATER-BEARING MATERIAL	FORMATION	WATER LEVEL (FT.)	WATER LEVEL DATE MEAS.	YIELD (GPM)	YIELD (METHOD DETER-MINED)	LOG AVAIL-ABLE	QW TYPE	REMARKS
20	SHALE	SONYEA FM	--	--	6	3	--	--	--
--	SAND AND GRAVEL	--	6	--	--	--	--	P	--
--	SAND AND GRAVEL	--	--	--	--	--	--	--	LARGE YIELD REPORTED
10	SHALE	SONYEA FM	--	--	25	--	--	P	--
--	SAND AND GRAVEL	--	+17	12-45	230	--	D	P	--
--	SAND AND GRAVEL	--	+38	9-49	400	--	D	P	SPEC. CAPACITY 5.8 GPM/FT
--	SAND AND GRAVEL	--	14	--	7	3	--	--	--
--	SAND AND GRAVEL	--	+42	11-55	78	1	D	C	SPEC. CAPACITY 0.65 GPM/FT
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
42	SHALE	GENESEE FM	24	11-65	10	3	D	--	--
--	COARSE GRAINED SAND	--	F	--	--	--	--	C	NAT. GAS; IRON
50	SHALE	JAVA & WEST FALLS FM	12	--	6	--	--	--	--
--	SILTY SAND	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	1	11-65	--	--	--	--	--
28	SHALE	GENESEE FM	40	11-65	3	3	--	--	--
73	SHALE	GENESEE FM	42	11-65	--	--	--	--	--
60	SHALE	GENESEE FM	37	11-65	--	--	--	--	NAT. GAS; SEDIMENT IN WATER
50	SHALE	GENESEE FM	23	--	6	3	--	--	NAT. GAS; H_2S
--	SAND AND GRAVEL	--	10	--	--	--	--	P	LARGE YIELD REPORTED
--	SAND AND GRAVEL	--	F	--	--	--	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	--	P	--
--	SAND AND GRAVEL	--	--	--	--	--	--	--	--
20	SHALY SANDSTONE	JAVA & WEST FALLS FM	10	-65	4	3	D	C	--
22	SILTY SHALE	SONYEA FM	11	--	1	3	--	--	--
15	SHALE	GENESEE FM	--	--	--	--	--	--	YIELD REPORTED VERY LOW
--	SAND AND GRAVEL	--	1	--	10	--	--	--	--
--	SAND AND GRAVEL	--	8	1-65	10	3	D	C	--
--	SILTY SAND	--	4	3-62	--	--	D	--	--
60	SHALE	GENESEE FM	--	--	--	--	--	--	INADEQUATE; SEDIMENT IN WATER
--	SAND AND GRAVEL	--	--	--	--	--	D	--	IRON
--	SAND AND GRAVEL	--	F	--	--	--	D	--	IRON; LARGE YIELD REPORTED
12	SHALE	SONYEA FM	--	--	8	3	D	--	--
--	SAND AND GRAVEL	--	6	--	--	--	D	--	IRON; LARGE YIELD REPORTED
--	SAND AND GRAVEL	--	9	--	--	--	--	C	IRON
--	SAND AND GRAVEL	--	--	--	--	--	D	--	SAND IN WATER; INADEQUATE
18	SHALE	SONYEA FM	--	--	2	3	--	--	--
67	SHALE	GENESEE FM	--	--	2	3	--	--	--
22	SHALE	SONYEA FM	8	--	10	--	--	P	--
--	SAND	--	30	--	--	--	D	--	--
--	SAND AND GRAVEL	--	40	7-56	4	3	D	--	--
--	SAND AND GRAVEL	--	10	--	--	--	--	--	IRON
24	SHALE	GENESEE FM	14	--	2	--	--	--	--
35	SHALY SILTSTONE	JAVA & WEST FALLS FM	--	--	8	3	--	--	--
31	SHALE	GENESEE FM	11	7-65	--	--	--	--	OBS. WELL, 1965 - 1966
59	SHALE	SONYEA FM	30	--	3	--	--	--	--
--	SAND AND GRAVEL	--	--	--	--	--	--	--	--
--	FINE GRAINED SAND	--	--	--	5	3	--	--	--
--	SAND AND GRAVEL	--	10	--	8	--	--	--	--
--	SAND AND GRAVEL	--	18	--	24	3	--	C	--
22	SHALE	SONYEA FM	18	7-66	4	3	D	--	--
75	SHALE	SONYEA FM	10	--	--	--	--	P	--
2	SHALE	GENESEE FM	--	--	--	--	--	P	--
--	SAND	--	--	--	--	--	D	--	--
330	FINE GRAINED SAND	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	+39	--	--	--	D	--	--
--	SAND AND GRAVEL	--	8	6-60	--	--	D	--	--
--	SAND AND GRAVEL	--	+39	--	--	--	D	--	--
--	SAND	--	--	--	--	--	D	--	--
--	SAND	--	--	--	--	--	D	--	--
--	COARSE GRAINED SAND	--	--	--	--	--	D	--	--
260	VERY FINE GRAINED SAND	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	+30	--	280	--	--	P	FLOWED AT 280 GPM
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	+41	--	--	--	D	C	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
10	SHALE	SONYEA FM	--	--	--	--	--	--	--
--	SAND AND GRAVEL	--	15	8-66	21	3	D	C	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	TILL	--	--	--	--	--	--	P	--
--	SHALE	GENESEE FM	3	--	--	--	--	P	--
17	SHALE	SONYEA FM	60	5-66	11	3	D	--	--
100	SHALE	SONYEA FM	25	1-66	6	3	D	--	--
3	SILTY SHALE	SONYEA FM	--	--		--	--	--	--
31	SHALE	SONYEA FM	10	6-66	2	3	D	C	--
30	SHALE	SONYEA FM	15	6-66	2	3	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND	--	--	--	--	--	D	--	SAND IN WATER
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
27	SHALE	GENESEE FM	20	--	3	--	--	--	H_2S

Table 5.--Records of selected wells and test holes in the Western Oswego River basin (Continued)

WELL NUMBER AND LOCATION	OWNER OR NAME	METHOD DRILLED	DATE DRILLED (YEAR)	WELL USE	WATER USE	WELL DEPTH (FT.)	CASING DEPTH (FT.)	CASING DIAMETER (IN.)	WELL FINISH	ALTITUDE OF LSD (FT.)
422754N0761556.1	DRYDEN GOLF CS	C	1963	W	H	82	82	5	O	1230
422754N0761650.1	K WILLIAMS	C	1963	W	H	79	79	5	O	1170
422814N0765536.1	J NAILER	C	1965	W	H	147	21	6	X	870
422824N0764206.1	H WIXOM	D	1840	W	H	12	12	18	W	1100
422830N0761715.1	L BRADLEY	C	1965	W	H	66	66	6	O	1180
422834N0761715.1	L BRADLEY	C	1964	W	H	125	125	5	O	1180
422835N0761716.1	L BRADLEY	C	1965	W	H	125	125	6	O	1160
422836N0762551.1	CAYUGA PRESS	--	1966	W	H	120	--	6	X	1070
422840N0761723.1	L BRADLEY	C	1965	W	H	90	90	6	O	1150
422844N0761724.1	L BRADLEY	C	1965	W	H	97	97	6	O	1150
422848N0762306.1	E EVANS	C	1965	W	H	147	120	6	X	1200
422849N0762401.1	K MARQUIS	C	1966	W	P	123	123	5	O	1010
422855N0762236.1	W CONGER	C	--	W	P	70	70	5	O	1050
422856N0762227.1	W CONGER	C	--	W	P	69	11	5	X	1080
422857N0761727.1	DRYDEN NY	C	1963	W	P	53	41	8	S	1100
422859N0761729.1	DRYDEN NY	C	1964	W	P	51	39	8	S	1100
422901N0762303.1	C HANCE	C	1940	W	H	96	96	6	O	1010
422901N0764026.1	H SMITH	C	1940	W	H	250	10	6	X	1250
422901N0764758.1	U S FOREST SER	C	--	W	P	100	20	5	X	1800
422903N0764853.1	U S FOREST SER	D	--	U	U	11	11	36	W	590
422905N0761449.1	DRYDEN NY	C	1948	W	P	176	--	10	S	1090
422905N0761749.2	DRYDEN NY	C	1946	T	U	192	191	6	O	1090
422907N0763420.1	R GREENWOOD	C	1966	W	H	74	24	5	X	1070
422910N0762037.1	D ELLIS	C	--	W	H	70	70	5	O	1150
422917N0762250.1	D MARTIN	C	--	W	H	64	64	6	O	1030
422921N0764946.1	HECTOR SCH DIST	C	1930	U	U	74	30	6	X	1350
422923N0762333.1	C BARTHOLOMEW	C	1963	W	H	62	62	6	O	1070
422935N0762906.1	FURY	C	1966	W	H	69	13	5	X	960
422942N0765216.1	HECTOR SCHOOL	C	--	W	T	140	140	6	O	830
422952N0764123.1	TRUMANSBURG NY	C	1955	T	U	72	40	8	X	1000
422958N0762157.1	J BORAWICK	C	1965	W	H	28	28	6	O	1030
423004N0761853.1	PORTZLAIN	C	1965	T	U	83	83	6	O	1110
423005N0762452.1	UNKNOWN	C	1965	W	H	94	75	5	X	1120
423005N0764140.1	TRUMANSBURG NY	C	1954	T	U	22	20	8	X	980
423006N0762048.1	R HITCHMAN	C	1965	W	H	171	185	6	O	1040
423007N0764141.1	TRUMANSBURG NY	C	1954	T	U	30	25	8	X	980
423013N0764133.1	TRUMANSBURG NY	C	1954	T	U	24	18	5	S	990
423018N0764101.1	TRUMANSBURG NY	C	1954	T	U	35	28	8	X	980
423022N0762130.1	L WERNICK	C	--	W	H	209	209	5	O	1030
423023N0764121.1	TRUMANSBURG NY	C	1954	T	U	51	46	8	X	1000
423024N0764039.1	TRUMANSBURG NY	C	1954	T	U	40	33	8	X	970
423025N0762010.1	GEORGE JR REPUB	C	1949	W	T	63	55	8	S	1100
423025N0762134.1	L WERNICK	C	1955	W	P	220	220	6	O	1030
423027N0764121.1	TRUMANSBURG NY	--	1956	W	P	43	38	8	S	1000
423027N0764130.1	TRUMANSBURG NY	C	1954	T	U	48	44	8	X	1000
423028N0764114.1	TRUMANSBURG NY	C	1954	T	U	60	58	8	X	1000
423031N0770110.1	W HOWELL	C	--	W	H	75	20	6	X	1160
423033N0764138.1	TRUMANSBURG NY	C	1954	T	U	50	42	6	X	1000
423037N0764137.1	TRUMANSBURG NY	C	1954	T	U	40	34	8	G	1000
423039N0761145.1	CORTLAND SCH DT	C	1953	W	T	66	66	6	O	1410
423042N0762054.1	K MARQUIS	C	1953	W	H	200	200	5	O	1050
423042N0764142.1	TRUMANSBURG NY	C	1955	T	U	40	36	6	X	1020
423043N0762035.1	HURST	C	1965	W	H	30	30	5	O	1060
423044N0762030.1	UNKNOWN	C	--	W	H	226	226	5	O	1060
423045N0762051.1	R SICKMAN	C	1964	W	D	220	220	5	O	1150
423048N0762037.1	L ARMITAGE	--	--	W	H	288	288	2	O	1050
423050N0762926.1	C REDLINE	C	1956	W	H	45	20	6	X	1020
423056N0762914.1	R SMALL	C	1966	W	P	72	18	5	X	1060
423056N0764032.1	TRUMANSBURG NY	C	1944	W	P	78	--	8	G	970
423102N0761923.1	N CRISPELL	C	1966	W	H	83	83	5	O	950
423103N0762020.1	NYSDPW	W	1962	T	U	85	--	--	--	1040
423111N0761946.1	J MARQUIS	C	--	W	H	60	60	5	O	1140
423112N0761940.1	NYSDPW	W	1962	T	U	71	64	--	X	1040
423120N0763540.1	L ELLIS	--	--	T	U	1846	472	7	X	860
423121N0765908.1	DUNDEE NY	--	1965	T	U	63	63	--	X	970
423128N0763758.1	OXLEY	C	1965	W	H	178	15	5	X	925
423131N0765723.1	C ROOF	C	1947	W	H	81	6	6	X	1080
423135N0765815.1	DUNDEE NY	C	1965	T	U	28	25	6	S	1000
423139N0765808.1	DUNDEE NY	C	1965	T	U	46	46	6	O	1000
423140N0770035.1	A WESTFALL	D	--	W	H	11	--	30	W	1060
423142N0765808.1	DUNDEE NY	C	1965	T	U	55	50	8	P	1000
423142N0765826.1	DUNDEE NY	C	1952	T	U	103	42	4	S	990
423143N0761923.1	H TERWILLIGER	C	1962	W	H	52	26	5	X	1080
423143N0765807.1	DUNDEE NY	C	1965	U	U	52	52	6	O	1000
423143N0765809.1	DUNDEE NY	C	1965	W	P	58	52	10	G	1000
423143N0765809.2	DUNDEE NY	C	1965	T	U	96	96	6	O	1000
423143N0765820.1	DUNDEE NY	C	1952	T	U	55	50	8	X	990
423144N0765825.1	DUNDEE NY	C	1952	T	U	119	82	4	S	990
423144N0765828.1	DUNDEE NY	C	1965	T	U	60	60	12	O	990
423145N0765808.1	DUNDEE NY	C	1965	T	U	57	57	8	O	1000

DEPTH TO CONSL. ROCK (FT.)	WATER-BEARING MATERIAL	FORMATION	WATER LEVEL (FT.)	WATER LEVEL DATE MEAS.	YIELD (GPM)	YIELD (METHOD DETER-MINED)	LOG AVAIL-ABLE	QW TYPE	REMARKS
--	SAND AND GRAVEL	--	76	--	5	3	--	--	--
--	SAND AND GRAVEL	--	--	--	9	3	D	P	--
21	SHALE	SONYEA FM	12	--	.5	3	--	--	--
--	SAND AND GRAVEL	--	9	8-66	--	--	--	P	DRY IN SUMMER; SALT WATER IN BEDROCK
--	SAND AND GRAVEL	--	49	10-65	30	3	D	--	--
--	SAND AND GRAVEL	--	44	--	20	3	--	--	--
--	SAND AND GRAVEL	--	F	--	9	3	D	C	--
--	SHALE	GENESEE FM	--	--	2	--	--	C	--
--	SAND	--	40	8-65	18	3	--	--	--
--	SAND AND GRAVEL	--	52	8-65	24	3	--	--	--
120	SHALE	GENESEE FM	--	--	1	3	--	--	--
--	SAND AND GRAVEL	--	6	--	20	3	--	--	IRON; SUPPLIES 12 APARTMENTS
--	SAND AND GRAVEL	--	--	--	20	3	--	--	--
11	SHALE	GENESEE FM	--	--	--	--	--	--	LARGE YIELD REPORTED
--	SAND AND GRAVEL	--	--	--	100	--	--	--	--
--	SAND AND GRAVEL	--	--	--	115	--	--	--	--
--	SAND AND GRAVEL	--	--	--	--	--	--	--	--
10	SHALE	SONYEA FM	0	--	10	--	--	--	--
10	SANDY SHALE	JAVA & WEST FALLS FM	40	--	5	3	D	P	SUPPLIES CAMPING AREA
10	TILL	--	6	8-65	--	--	--	--	--
--	SAND AND GRAVEL	--	--	--	85	--	--	--	--
--	SAND AND GRAVEL	--	+12	2-46	--	--	D	P	FLOWED AT 35 GPM
23	SHALE	GENESEE FM	22	10-66	6	3	--	C	H_2S
--	SAND AND GRAVEL	--	--	--	20	3	--	--	--
150	SAND AND GRAVEL	--	--	--	4	3	--	P	--
30	SHALE	SONYEA FM	F	--	2	--	--	--	--
--	SAND AND GRAVEL	--	13	9-65	10	3	--	--	--
12	SHALE	GENESEE FM	15	4-66	8	3	D	--	H_2S
--	SAND AND GRAVEL	--	20	--	9	--	--	--	--
70	SHALE	GENESEE FM	--	--	--	--	D	--	NO WATER REPORTED
--	SAND AND GRAVEL	--	--	--	2	3	D	--	--
--	SAND AND GRAVEL	--	6	--	11	3	D	--	--
74	SHALE	GENESEE FM	--	--	--	--	D	--	--
20	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	+3	--	6	3	--	--	WELL PARTLY FILLED WITH SAND
25	SAND AND GRAVEL	--	--	--	--	--	D	--	--
28	SAND AND GRAVEL	--	6	12-54	13	--	D	--	SPEC. CAPACITY 2.0 GPM/FT
25	SHALE	GENESEE FM	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	F	--	--	--	--	--	VERY LARGE YIELD REPORTED
46	SHALE	GENESEE FM	--	--	--	--	D	--	--
32	SHALE	GENESEE FM	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	F	--	--	--	--	P	PUMPED AT 100 GPM
--	SAND AND GRAVEL	--	F	--	--	--	--	--	VERY LARGE YIELD
40	SAND AND GRAVEL	--	12	--	110	--	D	P	SPEC. CAPACITY 7.6 GPM/FT
42	SAND AND GRAVEL	--	16	8-54	--	--	D	--	--
57	SHALE	GENESEE FM	--	--	--	--	D	--	--
20	SHALE	SONYEA FM	25	--	--	--	--	--	--
42	SAND AND GRAVEL	--	--	--	--	--	D	--	--
37	SAND AND GRAVEL	--	8	8-54	30	--	D	--	SPEC. CAPACITY 1.2 GPM/FT
--	SAND AND GRAVEL	--	45	3-53	20	--	--	P	--
--	SAND AND GRAVEL	--	F	--	--	--	--	P	--
36	SHALE	GENESEE FM	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	F	--	15	3	--	--	--
--	SAND AND GRAVEL	--	F	--	150	--	D	C	--
--	SAND AND GRAVEL	--	F	--	250	--	--	--	--
--	SAND AND GRAVEL	--	+20	--	--	--	--	P	SUPPLIES SEVERAL HOUSES
2	SHALE	GENESEE FM	--	--	--	--	--	--	--
4	SHALE	GENESEE FM	30	3-66	15	3	D	--	--
70	SILTY SAND AND GRAVEL	--	18	7-54	70	--	D	--	H_2S; SPEC. CAPACITY 5.3 GPM/FT
83	SAND AND GRAVEL	--	F	--	4	3	D	P	--
--	FINE GRAINED SAND	--	4	5-62	--	--	D	--	--
--	SAND AND GRAVEL	--	F	--	5	3	--	--	--
64	SHALE	GENESEE FM	+8	4-62	--	--	D	--	--
89	LIMESTONE	TULLY LS	385	--	50	--	--	P	DRILLED FOR GAS
62	SHALE	GENESEE FM	--	--	--	--	D	--	--
15	SHALE	GENESEE FM	--	--	3	3	--	--	--
6	SHALE	GENESEE FM	20	--	6	--	D	--	--
--	SAND AND GRAVEL	--	21	7-65	20	1	D	--	SPEC. CAPACITY 2.5 GPM/FT
--	SAND AND GRAVEL	--	23	--	25	3	D	--	SPEC. CAPACITY 1.5 GPM/FT
--	CLAYEY SAND	--	5	4-66	--	--	--	--	--
--	SAND AND GRAVEL	--	22	--	10	--	D	--	SPEC. CAPACITY 0.3 GPM/FT
--	SAND AND GRAVEL	--	18	--	25	--	D	--	--
26	SHALE	GENESEE FM	11	--	10	3	D	--	FLOWS IN SPRING
--	SAND AND GRAVEL	--	23	--	10	3	D	--	--
--	SAND AND GRAVEL	--	--	--	30	--	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	9	--	--	--	D	--	--
115	SAND AND GRAVEL	--	5	3-52	30	--	D	--	--
--	CLAYEY SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	23	--	10	3	D	--	--

Table 5.--Records of selected wells and test holes in the Western Oswego River basin (Continued)

WELL NUMBER AND LOCATION	OWNER OR NAME	METHOD DRILLED	DATE DRILLED (YEAR)	WELL USE	WATER USE	WELL DEPTH (FT.)	CASING DEPTH (FT.)	CASING DIAMETER (IN.)	WELL FINISH	ALTITUDE OF LSD (FT.)
423147N0763731.1	J SIMMONS	C	1963	W	H	180	14	5	X	840
423147N0765815.1	DUNDEE NY	--	1965	T	U	19	19	12	O	1000
423147N0765819.1	DUNDEE NY	C	1952	W	P	21	16	10	S	990
423149N0765807.1	DUNDEE NY	C	1965	T	U	43	43	8	O	1000
423150N0765749.1	DUNDEE NY	C	1965	T	U	40	40	8	O	1000
423150N0765806.1	DUNDEE NY	C	1965	T	U	44	44	8	O	1000
423150N0765813.1	DUNDEE NY	C	1952	O	U	33	28	2	P	1000
423152N0765117.1	D MONROE	C	1965	W	H	105	100	6	X	1060
423155N0765819.1	DUNDEE NY	C	1965	T	U	85	85	12	O	990
423157N0763820.1	B AND L MOTORS	C	1965	W	C	270	48	5	X	925
423157N0764003.1	TRUMANSBURG NY	C	1954	T	U	83	78	6	X	980
423158N0763014.1	J HANCHARIK	C	1966	W	H	66	7	5	X	880
423201N0762935.1	F HORVATH	C	1965	W	H	32	18	6	X	960
423205N0765906.1	H SLACK	C	1946	W	S	180	173	6	X	1200
423210N0765824.1	M WHEELER	C	1945	U	U	159	122	6	X	1060
423211N0762932.1	F HORVATH	C	1965	W	H	46	20	5	X	960
423213N0761653.1	J MCKINNEY	C	1959	W	H	97	97	5	O	1180
423215N0770010.1	M OVENSHIRE	D	--	W	H	14	14	30	--	1125
423216N0763237.1	IGA STORE	V	1955	W	H	30	30	2	T	400
423219N0761804.1	C RYAN	C	--	W	H	116	116	5	O	1120
423231N0763214.1	ATLANTIC OIL CO	C	1962	W	C	67	67	6	O	500
423232N0765826.1	R WILLIS	C	--	W	H	60	40	6	X	1100
423234N0761755.1	NYSDPW	--	1962	T	U	66	--	--	--	1090
423235N0765729.1	A GAYLORD	D	1830	W	H	17	17	36	W	995
423239N0765703.1	U SIMOSON	C	1963	W	H	82	--	6	O	1000
423244N0761521.1	E TARBELL	C	1963	W	H	162	20	6	X	1270
423255N0770027.1	D BRIGGS	C	1965	U	U	59	23	6	X	1140
423255N0770553.1	S KENYON	C	1947	W	C	33	--	6	X	720
423258N0770028.1	D BRIGGS	O	--	U	U	10	10	30	W	1135
423259N0763733.1	G DYKE	D	--	W	H	17	0	84	X	680
423302N0761732.1	H JEFFERY	C	1946	W	H	112	95	6	X	1130
423304N0761735.1	P MUNSON	C	1948	W	H	70	70	6	O	1230
423305N0761438.1	S GRISWOLD	C	1965	W	S	254	254	6	O	--
423308N0763213.1	C KINTZ	C	1930	W	H	40	9	6	X	460
423310N0763203.1	E INMAN	C	1966	W	H	40	14	6	X	430
423312N0765201.1	N WELLS	A	1965	W	H	120	10	6	X	840
423313N0765102.1	N WELLS	D	--	W	H	20	--	36	W	840
423314N0765101.1	N WELLS	C	--	U	U	27	--	4	X	840
423318N0761509.1	U S DEPT OF INT	--	1962	T	U	52	42	6	P	1120
423318N0761509.2	U S DEPT OF INT	C	1962	W	O	52	42	8	S	1120
423318N0761514.1	U S DEPT OF INT	C	1962	T	U	126	124	6	P	1100
423318N0761516.1	U S DEPT OF INT	C	1962	T	U	125	115	5	S	1100
423318N0761516.2	U S DEPT OF INT	C	1962	T	U	124	114	6	P	1100
423318N0761516.3	U S DEPT OF INT	C	1962	U	U	125	--	6	S	1100
423319N0761459.1	U S DEPT OF INT	C	1962	T	U	56	46	8	S	1120
423320N0761459.1	U S DEPT OF INT	C	1959	T	U	200	185	8	X	1120
423327N0761457.1	U S DEPT OF INT	C	1962	T	U	135	131	4	P	1140
423327N0761457.2	U S DEPT OF INT	C	1964	W	O	120	71	12	S	1140
423327N0761457.3	U S DEPT OF INT	C	1962	T	U	137	55	6	P	1140
423328N0764652.1	E JAMES	C	1946	W	H	265	16	6	X	1530
423328N0765522.1	A SMITH	C	1942	W	--	65	6	6	X	660
423329N0761455.1	U S DEPT OF INT	C	1962	T	U	215	197	8	X	1150
423329N0763900.1	M MITTERER	C	1965	W	H	160	42	6	X	780
423335N0763312.1	J ROSE	C	1965	W	H	40	20	6	X	880
423335N0763319.1	J ETTINGER	C	1964	W	H	41	20	6	X	880
423336N0763836.1	C GEORGIA	C	1940	W	H	31	12	6	X	680
423349N0765145.1	T STEWART	C	1965	W	H	120	12	6	X	880
423349N0765820.1	T LEECH	C	1964	W	H	125	--	6	X	1140
423408N0765551.1	C SMITH	C	1939	W	H	50	--	6	X	720
423414N0772729.1	MIDDLETON	C	1947	U	U	90	90	6	O	1390
423416N0772721.1	P FLEISHMAN	C	1956	W	S	142	142	6	O	1390
423425N0763924.1	G HUCKLES	C	1963	W	H	125	6	5	X	690
423427N0770817.1	R LOGAN	C	1947	W	H	43	20	6	X	770
423439N0765742.1	E OSSONT	D	1860	W	H	18	18	36	W	965
423441N0772737.1	R MERRILL	C	1947	W	H	45	45	6	O	1380
423448N0761751.1	H KNAPP	C	1965	W	H	61	61	6	O	1260
423448N0770553.1	R PECK	C	1947	W	H	72	18	6	X	730
423511N0764546.1	C TRELEAVEN	C	--	W	H	68	20	6	X	1260
423519N0772421.1	R JEROME	C	1963	W	H	43	40	6	X	1130
423526N0772803.1	M PECK	C	1950	W	S	156	95	6	X	1420
423528N0765600.1	H HALL	C	1917	W	H	90	10	--	X	660
423528N0772417.1	MEEKER	C	1966	W	H	100	30	6	X	1120
423539N0765525.1	J SUGDEN	C	1939	W	H	245	5	6	X	530
423540N0765636.1	R SUMMERSON	C	1943	W	S	50	10	6	X	700
423540N0770909.1	J COOK	C	1947	W	--	215	24	6	X	740
423544N0772417.1	S BLANCHARD	C	--	W	H	190	40	6	X	1060
423547N0770911.1	J SANDERSON	C	1946	W	--	84	23	6	X	730
423553N0770924.1	G FORSLING	C	1946	W	H	32	22	6	X	800
423554N0770916.1	H SUTHERLAND	C	1946	--	--	29	23	6	X	740
423559N0765638.1	C CULVER	C	1915	W	C	125	48	6	X	710

DEPTH TO CONSL. ROCK (FT.)	WATER-BEARING MATERIAL	FORMATION	WATER LEVEL (FT.)	WATER LEVEL DATE MEAS.	YIELD (GPM)	YIELD (METHOD DETER-MINED)	LOG AVAIL-ABLE	QW TYPE	REMARKS
14	SHALE	GENESEE FM	65	--	4	3	--	P	GAS; SALTY
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	2	8-52	200	--	D	--	SPEC. CAPACITY 69 GPM/FT
--	SAND AND GRAVEL	--	26	7-65	4	3	D	--	--
--	TILL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	26	7-65	10	3	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	H_2S
100	SHALE	GENESEE FM	42	--	4	3	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
48	SAND	--	76	8-65	2	3	--	--	SOME WATER FROM BEDROCK
78	SAND AND GRAVEL	--	--	--	--	--	D	--	FINISHED IN BEDROCK
7	SHALE	GENESEE FM	10	7-66	8	3	D	--	--
4	SHALE	GENESEE FM	4	5-65	9	3	--	--	--
173	SHALE	SONYEA FM	7	--	--	--	D	--	--
122	SHALE	GENESEE FM	--	--	--	--	D	--	--
5	SHALE	GENESEE FM	5	11-65	20	3	D	--	--
--	SAND AND GRAVEL	--	20	--	30	3	D	--	--
--	TILL	--	8	4-66	--	--	--	C	--
--	SAND AND GRAVEL	--	10	--	--	--	--	--	--
--	SAND AND GRAVEL	--	80	--	15	3	--	--	--
--	SAND AND GRAVEL	--	--	--	8	3	--	--	--
40	SHALE	SONYEA FM	--	--	--	--	--	--	--
--	SILTY SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	15	8-66	300	--	--	P	REPORT 1 FT OF DD AT 300 GPM
--	SAND AND GRAVEL	--	59	--	2	--	--	C	--
20	SHALE	GENESEE FM	--	--	--	--	--	--	--
22	SHALE	SONYEA FM	12	4-66	--	--	--	P	--
26	SHALE	GENESEE FM	16	--	--	--	--	--	--
--	TILL	--	5	4-66	--	--	--	--	--
0	SHALE	GENESEE FM	6	4-66	--	--	--	--	LOW YIELD
95	SHALE	GENESEE FM	--	--	9	3	--	--	H_2S
95	SAND	--	20	--	12	3	--	P	--
254	SAND	--	96	10-65	8	3	--	--	--
9	SHALE	HAMILTON FM	26	9-66	--	--	--	--	H_2S
5	SHALE	HAMILTON FM	16	11-66	40	3	D	--	--
8	SHALE	GENESEE FM	14	9-65	2	3	D	--	--
10	TILL	--	16	9-65	--	--	--	--	--
10	SHALE	GENESEE FM	10	9-65	--	--	--	--	--
181	SAND AND GRAVEL	--	8	--	--	--	D	--	--
181	SAND AND GRAVEL	--	F	--	154	--	D	P	SPEC. CAPACITY 8.5 GPM/FT
--	SAND AND GRAVEL	--	+3	--	--	--	D	--	--
--	SAND AND GRAVEL	--	F	--	83	--	D	--	SPEC. CAPACITY 1.1 GPM/FT
--	SAND AND GRAVEL	--	F	--	--	--	D	--	--
--	SAND AND GRAVEL	--	F	--	--	--	--	--	--
--	SAND AND GRAVEL	--	F	--	--	--	D	--	--
--	SILTY SAND AND GRAVEL	--	+4	--	42	--	D	P	SPEC. CAPACITY 12 GPM/FT
--	SAND AND GRAVEL	--	F	--	74	--	D	--	SPEC. CAPACITY 3.2 GPM/FT
--	SAND AND GRAVEL	--	F	--	575	--	D	P	--
--	SAND AND GRAVEL	--	F	--	--	--	D	--	--
6	SHALY SILTSTONE	JAVA & WEST FALLS FM	5	--	2	--	--	P	--
6	SHALE	GENESEE FM	--	--	15	--	D	--	--
197	SAND AND GRAVEL	--	3	10-62	25	--	D	--	--
42	SHALY SILTSTONE	GENESEE FM	10	5-65	1	3	D	--	--
20	SHALE	GENESEE FM	10	8-65	15	3	--	--	--
15	SHALE	GENESEE FM	10	8-65	40	3	--	--	--
12	SHALE	GENESEE FM	8	--	1	--	--	P	--
12	SHALY SILTSTONE	GENESEE FM	30	8-65	2	3	D	--	H_2S
--	SHALE	SONYEA FM	--	--	--	--	--	P	--
--	SHALE	GENESEE FM	--	--	--	--	--	--	--
--	SAND AND GRAVEL	--	60	--	15	--	D	--	--
--	COARSE GRAINED SAND	--	80	-56	--	--	D	--	--
6	SHALE	GENESEE FM	--	--	2	3	--	--	--
20	SHALE	GENESEE FM	25	--	--	--	D	--	H_2S
--	SAND AND GRAVEL	--	8	--	--	--	--	P	--
--	SAND AND GRAVEL	--	33	8-47	15	3	D	C	--
--	SAND AND GRAVEL	--	--	--	20	3	D	--	--
18	SHALE	GENESEE FM	28	--	--	--	D	--	--
20	SHALE	SONYEA FM	10	--	5	--	--	P	--
40	SANDY SHALE	JAVA & WEST FALLS FM	8	--	--	--	--	--	IRON
93	SHALE	JAVA & WEST FALLS FM	--	--	2	3	D	--	--
10	SHALE	GENESEE FM	10	--	--	--	D	--	--
30	SANDY SHALE	SONYEA FM	--	--	--	--	--	--	YIELD ABOUT 4 GPM
5	CALCAREOUS SHALE	HAMILTON FM	100	--	--	--	D	--	--
10	SHALE	GENESEE FM	10	--	--	--	D	--	--
24	SHALE	GENESEE FM	18	--	--	--	D	--	GAS WHEN DRILLED
40	SANDY SHALE	SONYEA FM	--	--	--	--	--	--	IRON
23	SHALE	GENESEE FM	15	--	--	--	D	--	H_2S
22	SHALE	GENESEE FM	10	--	42	--	D	--	H_2S
23	SHALE	GENESEE FM	8	--	--	--	D	--	H_2S
48	SHALE	GENESEE FM	30	--	--	--	D	--	--

Table 5.--Records of selected wells and test holes in the Western Oswego River basin (Continued)

WELL NUMBER AND LOCATION	OWNER OR NAME	METHOD DRILLED	DATE DRILLED (YEAR)	WELL USE	WATER USE	WELL DEPTH (FT.)	CASING DEPTH (FT.)	CASING DIAMETER (IN.)	WELL FINISH	ALTITUDE OF LSD (FT.)
423601N0764704.1	T YOUNG	C	1944	W	H	54	18	6	X	1270
423602N0770854.1	DUNHAM	C	1950	Z	U	165	165	6	O	720
423602N0771918.1	W EVELAND	C	1959	W	H	27	20	6	X	1280
423604N0765641.1	R SUMMERSON	C	1942	W	H	50	50	6	O	720
423606N0761749.1	B DEMOND	C	1965	W	H	80	60	6	X	1300
423609N0770927.1	G FORSLING	C	1958	W	H	35	35	6	O	770
423613N0761715.1	H DEMOND	C	--	W	H	28	28	6	O	1260
423614N0772452.1	G PRESTON	C	--	U	U	41	41	6	O	850
423622N0771744.1	A WILLIAMS	A	1959	W	H	87	87	6	O	1120
423622N0771750.1	J ELWELL	D	--	W	H	12	--	36	W	1120
423624N0771742.1	J CAVES	A	1959	W	H	109	109	6	O	1120
423625N0771741.1	B DAVIS	C	1960	W	H	22	22	6	O	1120
423626N0771740.1	J ELWELL	A	1964	W	H	27	27	6	O	1120
423629N0770137.1	J COOK	C	1947	W	S	101	28	6	X	1120
423630N0771737.1	T MCMICHAEL	C	1961	W	H	46	46	6	O	1120
423631N0771737.1	J HICKS	C	1961	W	H	48	48	6	O	1120
423636N0764925.1	C AHOUSE	C	--	O	H	61	31	6	X	1095
423647N0764932.1	E HOLTON	C	1946	W	H	65	39	6	X	1060
423652N0770219.1	R ANDERSON	C	1947	W	H	58	36	6	X	1080
423652N0770555.1	N SUTFIN	C	1946	U	U	100	43	6	X	800
423653N0761709.1	F CLARK	C	1935	W	S	53	53	6	O	1280
423656N0761708.1	F CLARK	--	--	W	H	40	40	--	O	1280
423658N0770220.1	H PASTER	C	1947	W	H	43	29	6	X	1060
423700N0770607.1	G HOPKINS	C	1927	W	H	58	40	6	X	820
423708N0770556.1	D HOPKINS	C	1947	W	H	125	55	6	X	820
423714N0772608.1	E HERRICK	C	1947	W	H	37	23	6	X	1100
423722N0765218.1	H WYCKOFF	C	--	W	H	57	40	6	X	500
423722N0770601.1	L HOPKINS	C	1940	W	H	92	60	6	X	880
423727N0765959.1	ELDER	C	1947	W	H	42	38	6	X	980
423730N0765045.1	E HOUSNIC	C	1965	W	H	82	16	6	X	860
423730N0770956.1	S FRAREY	C	1953	W	H	48	48	6	O	770
423731N0764341.1	J USHER	C	1934	T	U	368	22	6	X	880
423732N0772247.1	E WILLIAMS	C	1954	U	U	125	22	6	X	720
423733N0770540.1	NYSDPW	W	1966	T	U	23	--	2	--	800
423734N0772248.1	F BLAZACK	V	1960	W	H	18	18	1 1/4	T	720
423735N0772328.1	YODEI INN	C	1965	W	C	53	53	6	O	720
423735N0772332.1	J HOLLAND	V	1964	W	H	20	20	2	T	720
423741N0770932.1	USGS	B	1966	T	U	68	--	6	X	750
423743N0770225.1	A ANSLEY	C	1935	W	S	56	21	6	X	970
423747N0770534.1	NYSDPW	W	1966	T	U	34	--	2	O	800
423801N0770955.1	V BENNET	C	1963	W	H	102	102	6	O	780
423802N0770007.1	L WOOLEVER	C	1947	W	H	59	27	6	X	930
423804N0764214.1	UNKNOWN	C	1965	W	H	202	17	6	X	610
423804N0765929.1	C MILLS	C	1944	W	H	56	19	6	X	880
423806N0772308.1	F SAUNDERS	C	1948	W	H	150	9	6	X	860
423807N0765914.1	H WHEELER	C	1945	W	S	60	10	6	X	880
423811N0770528.1	NYSDPW	W	1966	T	U	33	--	2	X	840
423817N0765514.1	C HILL	C	1963	W	H	85	85	6	O	500
423817N0765517.1	JENSEN	C	1964	W	H	150	95	6	X	520
423820N0761940.1	EM LEWIS	C	1955	W	C	60	45	6	X	1520
423835N0770247.1	J LIBECK	C	1965	W	C	62	30	6	X	900
423837N0772220.1	USGS	B	1966	T	U	68	--	6	O	700
423847N0772501.1	R MCCURMICK	C	1948	W	H	66	66	6	O	1425
423851N0770309.1	NYSDPW	A	1959	U	U	252	27	6	X	860
423855N0770457.1	NYSDPW	W	1967	T	U	26	--	2	O	820
423857N0770942.1	E THOMAS	D	--	W	H	17	17	30	W	820
423859N0770451.1	NYSDPW	W	1966	T	U	32	--	2	X	800
423902N0765637.1	A ESKILDSEN	C	1946	W	H	25	25	6	O	760
423904N0771613.1	USGS	B	1964	T	U	85	--	3	X	910
423908N0770153.1	R COREY	C	1946	W	H	66	50	6	X	800
423912N0771600.1	USGS	B	1964	T	U	57	--	3	X	930
423916N0770403.1	J MADISON	C	1947	W	--	25	25	6	O	720
423923N0770330.1	COMSTOCK FOOD	C	1966	W	N	118	91	6	S	720
423928N0771956.1	R CHATMAN	V	--	W	H	11	11	1 1/4	T	700
423932N0764522.1	UNKNOWN	C	1965	U	U	365	12	6	X	840
423939N0770026.1	R CARLSON	D	--	W	H	31	31	36	W	680
423940N0770024.1	R CARLSON	C	1947	U	U	150	96	6	X	680
423943N0770915.1	USGS	B	1966	T	U	78	--	6	X	800
423953N0763252.1	D HAND	C	1955	W	H	100	15	6	X	1060
423958N0770916.1	W BROWN	C	1959	W	H	50	50	6	O	860
424002N0765110.1	R COLE	C	1965	W	H	164	12	6	X	740
424006N0761633.1	L PHILLIPS	C	1961	W	H	117	70	6	O	1400
424025N0763206.1	TOWN OF GENOA	C	1965	U	U	13	13	8	O	850
424025N0763209.1	TOWN OF GENOA	C	1965	W	P	30	20	8	S	850
424025N0763210.1	TOWN OF GENOA	C	1965	W	P	30	20	8	S	850
424026N0763208.1	TOWN OF GENOA	C	1965	U	U	148	54	8	X	850
424028N0764913.1	OVID NY	C	1939	W	P	20	15	18	S	970
424041N0772456.1	H WEISS	C	1948	W	H	72	23	6	X	1620
424042N0771415.1	USGS	B	1964	T	U	10	--	3	X	910
424046N0765014.1	S SHAW	C	1947	W	C	115	52	6	X	800

DEPTH TO CONSL. ROCK (FT.)	WATER-BEARING MATERIAL	FORMATION	WATER LEVEL (FT.)	WATER LEVEL DATE MEAS.	YIELD (GPM)	YIELD (METHOD DETER-MINED)	LOG AVAIL-ABLE	QW TYPE	REMARKS
18	SHALE	SONYEA FM	35	--	6	--	--	P	--
--	SILTY CLAY	--	--	--	--	--	--	--	--
18	SHALE	JAVA & WEST FALLS FM	10	--	--	--	--	--	--
--	SAND AND GRAVEL	--	10	--	--	--	D	--	--
60	SHALE	GENESEE FM	25	--	10	3	D	--	--
--	SAND AND GRAVEL	--	8	--	--	--	--	P	H_2S; SEDIMENT AT TIMES
--	SAND AND GRAVEL	--	13	11-65	--	--	--	--	--
--	FINE GRAINED SAND	--	9	10-65	4	--	D	--	WELL PLUGGED WITH SAND
--	SAND AND GRAVEL	--	6	7-59	36	3	D	--	--
--	SAND AND GRAVEL	--	4	3-65	--	--	--	--	--
--	SAND AND GRAVEL	--	3	7-59	36	3	D	--	--
--	SAND AND GRAVEL	--	16	9-60	--	--	D	--	--
--	SAND AND GRAVEL	--	8	3-65	3	3	D	--	--
28	SHALE	GENESEE FM	22	--	30	--	D	--	GAS
--	SAND AND GRAVEL	--	34	10-61	5	3	D	--	--
--	SAND AND GRAVEL	--	36	0-61	5	3	D	--	--
31	SHALE	SONYEA FM	23	2-65	--	--	--	--	OBS. WELL 1965 - 1966
39	SHALE	SONYEA FM	6	--	20	--	D	P	--
34	SHALE	GENESEE FM	8	--	3	--	D	--	--
43	SHALE	GENESEE FM	33	--	2	--	D	--	H_2S
--	SAND	--	15	--	--	--	--	--	--
--	SAND AND GRAVEL	--	--	--	--	--	--	--	--
29	SHALE	GENESEE FM	3	--	4	--	D	--	--
--	CEMENTED SAND AND GRAVEL	--	1	--	8	--	D	--	SPEC. CAPACITY .16 GPM/FT
55	SHALE	GENESEE FM	15	--	.25	--	D	--	--
22	SHALE	JAVA & WEST FALLS FM	12	--	2	3	D	--	GAS
38	SHALE	GENESEE FM	25	--	20	--	--	P	--
60	SHALE	GENESEE FM	14	--	--	--	D	--	--
38	SHALE	GENESEE FM	15	--	6	--	D	--	--
16	SHALE	GENESEE FM	22	--	3	3	D	--	--
--	SAND AND GRAVEL	--	10	--	--	--	--	P	--
20	SHALE	GENESEE FM	11	--	6	--	--	--	--
22	SHALE	SONYEA FM	3	7-66	--	--	D	--	GAS; H_2S (?)
--	SAND AND GRAVEL	--	10	8-66	--	--	D	--	--
--	SAND AND GRAVEL	--	3	9-66	--	--	--	P	--
--	SAND AND GRAVEL	--	10	--	--	--	D	C	SPEC. CAPACITY 20 GPM/FT
--	SAND AND GRAVEL	--	16	--	--	--	--	--	LARGE YIELD REPORTED
--	SAND AND GRAVEL	--	--	--	--	--	G	--	--
21	SHALE	GENESEE FM	4	--	--	--	D	--	--
40	SILTY SAND AND GRAVEL	--	16	8-66	--	--	D	--	--
--	SAND AND GRAVEL	--	10	-65	--	--	--	C	INADEQUATE
27	SHALE	GENESEE FM	8	--	9	--	D	--	--
8	SHALE	GENESEE FM	12	6-65	--	--	--	--	--
19	SHALE	GENESEE FM	10	--	50	--	D	--	--
8	SHALE	SONYEA FM	110	--	.1	--	D	--	--
10	SHALE	GENESEE FM	6	--	--	--	D	--	--
28	SHALE	GENESEE FM	11	10-66	--	--	D	--	--
95	SILTY SAND	--	--	--	--	--	--	--	INADEQUATE
95	SHALE	HAMILTON GR	--	--	--	--	--	--	INADEQUATE
45	SHALE	GENESEE FM	--	--	--	--	--	C	WATER REPORTED UNDRINKABLE
26	SHALE	GENESEE FM	11	7-65	40	3	--	--	--
--	SAND AND GRAVEL	--	+6	10-66	--	--	G	C	FLOWED AT 10 GPM
--	SEMICONSOL SAND	--	60	7-48	2	3	D	--	--
27	SHALE	GENESEE FM	27	11-65	--	--	--	--	INADEQUATE
30	SILTY SAND AND GRAVEL	--	9	1-67	--	--	D	--	--
--	SAND AND GRAVEL	--	10	8-66	--	--	--	P	--
22	SHALE	GENESEE FM	16	12-66	--	--	D	--	--
--	SAND AND GRAVEL	--	3	--	--	--	D	--	--
85	SAND AND GRAVEL	--	--	--	--	--	G	--	--
50	SHALE	GENESEE FM	30	--	--	--	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	G	--	--
--	SAND AND GRAVEL	--	24	--	2	--	D	--	--
--	SAND AND GRAVEL	--	--	--	230	--	--	C	--
--	SAND AND GRAVEL	--	2	--	--	--	--	--	--
12	SHALE	GENESEE FM	--	--	.25	3	D	--	--
96	TILL	--	16	8-66	--	--	--	P	--
96	LIMESTONE	TULLY LS	60	--	1	--	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	G	--	--
15	SHALE	GENESEE FM	--	--	--	--	--	C	--
50	SAND AND GRAVEL	--	--	--	--	--	--	P	INADEQUATE
10	SHALE	GENESEE FM	39	9-65	2	3	D	--	--
70	SHALE	GENESEE FM	--	--	--	--	--	P	--
54	SAND AND GRAVEL	--	4	1-66	--	--	--	--	--
54	SAND AND GRAVEL	--	5	1-66	--	--	--	--	--
54	SAND AND GRAVEL	--	5	1-66	165	1	--	--	--
54	SHALE	GENESEE FM	+1	1-66	--	--	--	C	GAS; IRON
30	SAND AND GRAVEL	--	F	--	200	--	--	P	--
22	SHALE	JAVA & WEST FALLS FM	10	--	5	--	D	P	--
10	SAND AND GRAVEL	--	--	--	--	--	G	--	--
18	SHALE	GENESEE FM	10	--	10	--	D	P	--

Table 5.--Records of selected wells and test holes in the Western Oswego River basin (Continued)

WELL NUMBER AND LOCATION	OWNER OR NAME	METHOD DRILLED	DATE DRILLED (YEAR)	WELL USE	WATER USE	WELL DEPTH (FT.)	CASING DEPTH (FT.)	CASING DIAMETER (IN.)	WELL FINISH	ALTITUDE OF LSD (FT.)
424051N0761813.1	G DEMOND	C	1951	W	C	25	25	6	O	1320
424052N0765754.1	R JACOBS	C	1922	Z	U	187	187	6	O	580
424052N0772627.1	M HALE	C	1948	W	H	108	108	8	O	1790
424053N0764644.1	NYS DEPT PUB WK	C	1961	W	H	250	10	6	X	790
424104N0770808.1	C DECKER	C	1956	W	H	53	--	6	X	930
424106N0771718.1	USGS	B	1966	T	U	93	--	6	X	700
424107N0771345.1	USGS	B	1964	T	U	20	--	3	X	900
424112N0772506.1	J DECLEMENTE	C	1948	W	H	108	61	6	X	1690
424113N0771352.1	USGS	B	1964	T	U	87	--	3	X	890
424114N0770602.1	CASTNER	C	1962	W	H	40	24	6	X	1200
424117N0771359.1	USGS	B	1964	T	U	24	--	3	X	910
424121N0770356.1	J FRANCISCO	C	1945	W	H	32	30	6	X	1100
424126N0771118.1	SOIL CONS SER	H	1966	T	U	32	--	3	O	890
424127N0771316.1	SOIL CONS SER	H	1965	T	U	26	--	3	X	950
424128N0771101.1	SOIL CONS SER	H	1966	T	U	20	--	3	X	940
424128N0771111.1	SOIL CONS SER	H	1966	T	U	42	--	3	O	890
424128N0771136.1	SOIL CONS SER	H	1966	T	U	31	--	3	O	940
424129N0771130.1	SOIL CONS SER	H	1966	T	U	30	--	3	O	900
424130N0771308.1	SOIL CONS SER	H	1965	T	U	19	--	3	X	1000
424130N0771310.1	SOIL CONS SER	H	1965	T	U	30	--	3	X	980
424130N0771314.1	SOIL CONS SER	H	1965	T	U	20	--	3	X	940
424131N0771120.1	SOIL CONS SER	H	1966	T	U	90	--	3	O	890
424131N0771312.1	SOIL CONS SER	H	1965	T	U	30	--	3	X	950
424132N0771314.1	SOIL CONS SER	H	1965	T	U	35	--	3	X	940
424133N0771247.1	J GULE	C	1948	W	H	50	45	6	X	1060
424133N0771308.1	SOIL CONS SER	H	1965	T	U	19	--	3	X	970
424133N0771311.1	SOIL CONS SER	H	1965	T	U	26	--	3	X	940
424134N0771318.1	SOIL CONS SER	H	1965	T	U	52	--	3	X	910
424134N0771321.1	SOIL CONS SER	H	1965	T	U	30	--	3	O	900
424135N0771310.1	SOIL CONS SER	H	1965	T	U	33	--	3	X	950
424135N0771319.1	SOIL CONS SER	H	1965	T	U	53	--	3	X	900
424135N0771320.1	SOIL CONS SER	H	1965	T	U	36	--	3	O	900
424137N0771307.1	SOIL CONS SER	H	1965	T	U	26	--	3	X	950
424137N0771318.1	SOIL CONS SER	H	1965	T	U	36	--	3	O	900
424137N0771321.1	SOIL CONS SER	H	1965	T	U	74	--	3	X	900
424138N0771323.1	SOIL CONS SER	H	1966	T	U	81	--	3	X	900
424138N0771327.1	SOIL CONS SER	H	1966	T	U	106	--	3	O	890
424139N0771324.1	SOIL CONS SER	H	1966	T	U	100	--	3	X	890
424141N0771323.1	SOIL CONS SER	H	1966	T	U	72	--	3	O	890
424141N0771326.1	SOIL CONS SER	H	1966	T	U	102	--	3	X	890
424143N0771328.1	SOIL CONS SER	H	1966	T	U	95	--	3	X	900
424144N0771330.1	SOIL CONS SER	H	1965	T	U	93	--	3	X	900
424145N0771332.1	SOIL CONS SER	H	1966	T	U	56	--	3	O	910
424147N0771334.1	SOIL CONS SER	H	1965	T	U	36	--	3	X	940
424148N0765124.1	UNKNOWN	D	--	U	U	17	--	60	W	680
424148N0771336.1	SOIL CONS SER	H	1965	T	U	36	--	3	X	940
424153N0765733.1	HERBST	C	1947	W	H	75	8	6	X	460
424205N0771622.1	G KING	C	1954	W	--	53	12	6	X	780
424208N0771644.1	S EMERSON	C	1954	U	U	192	192	6	O	720
424209N0771226.1	USGS	B	1964	T	U	37	--	3	X	890
424218N0770400.1	A BUCKLEY	C	1946	W	H	73	28	6	X	1100
424223N0765758.1	S CHRISTENSEN	A	1963	W	H	80	60	6	X	540
424228N0764714.1	S SWINEHART	C	1947	W	H	179	45	6	X	700
424233N0772451.1	ONTARIO COUNTY	A	1966	W	P	205	10	8	X	2140
424240N0761650.1	F MEAD	C	1960	W	H	120	25	6	X	1650
424251N0770519.1	P QUENAN	C	1966	W	H	42	20	6	X	1150
424253N0770522.1	H MURDOCK	C	1963	W	H	31	27	6	X	1145
424256N0772530.1	OLESON	C	1950	W	H	52	52	6	O	1260
424301N0772530.1	D WEATHERUP	C	--	W	H	125	108	6	X	1280
424304N0771554.1	DUDLEY POULTRY	C	--	U	U	135	135	8	S	720
424307N0772516.1	J PANZARELLA	C	1949	--	H	23	23	6	O	1220
424308N0772541.1	UNKNOWN	C	1949	W	H	25	25	6	O	1330
424325N0764757.1	E KULESO	C	1943	W	H	120	67	6	X	710
424330N0771316.1	SOIL CONS SER	H	1965	T	U	45	--	3	X	930
424330N0771549.1	MIDDLESEX T	H	1963	T	U	131	--	6	O	740
424330N0771929.1	W SCHAEFFER	C	--	W	H	24	24	6	O	700
424331N0771534.1	MIDDLESEX T	H	1963	T	U	102	--	6	S	760
424331N0771539.1	MIDDLESEX T	H	1963	T	U	131	--	6	O	750
424333N0763415.1	L REJMAN	C	--	W	H	220	25	6	X	1180
424337N0761706.1	R HAMDAN	D	1900	W	H	16	16	36	W	1560
424346N0771929.1	UNKNOWN	C	1965	W	H	118	45	6	X	820
424347N0772108.1	C BURNETT JR	C	1954	W	--	170	40	6	X	700
424351N0770524.1	C MORTENSEN	C	1947	W	H	112	50	6	X	1080
424353N0763702.1	S CAYUGA SCHOOL	C	1965	W	T	75	72	8	G	1050
424359N0763645.1	S CAYUGA SCHOOL	H	1964	T	U	43	--	6	X	1060
424401N0763628.1	S CAYUGA SCHOOL	H	1964	T	U	69	--	6	X	1080
424405N0763708.1	S CAYUGA SCHOOL	H	1965	T	U	165	161	6	X	1040
424405N0770404.1	L LEDGERWOOD	C	1940	W	S	106	85	6	X	1080
424406N0770530.1	J BARDEN	C	1917	W	S	120	100	6	X	1040

DEPTH TO CONSL. ROCK (FT.)	WATER-BEARING MATERIAL	FORMATION	WATER LEVEL (FT.)	WATER LEVEL DATE MEAS.	YIELD (GPM)	YIELD (METHOD DETER-MINED)	LOG AVAIL-ABLE	QW TYPE	REMARKS
--	SILTY SAND AND GRAVEL	--	--	--	--	--	--	C	LARGE YIELD REPORTED
--	SAND AND GRAVEL	--	20	--	--	--	D	--	INADEQUATE
--	SAND AND GRAVEL	--	70	--	7	--	D	--	--
6	SHALE	GENESEE FM	--	--	4	3	--	C	GAS; TURBID
--	SHALE	GENESEE FM	--	--	--	--	--	--	H_2S
--	SILTY SAND	--	--	--	--	--	G	--	--
20	SAND	--	--	--	--	--	G	--	--
60	SOFT SHALE	JAVA & WEST FALLS FM	10	7-48	4	3	D	--	--
--	SAND	--	--	--	--	--	G	--	--
24	SHALE	SONYEA FM	--	--	12	3	--	P	--
--	TILL	--	--	--	--	--	D	--	--
30	SHALE	SONYEA FM	20	--	.5	--	--	--	IRON
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
16	SHALE	GENESEE FM	--	--	--	--	D	--	--
10	SHALE	GENESEE FM	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
18	SHALE	GENESEE FM	--	--	--	--	D	--	--
4	SHALE	GENESEE FM	--	--	--	--	D	--	--
10	SHALE	GENESEE FM	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
14	SHALE	GENESEE FM	--	--	--	--	D	--	--
24	SHALE	GENESEE FM	--	--	--	--	D	--	--
45	SHALE	SONYEA FM	--	--	5	--	--	--	FINE SAND IN WATER AT TIMES
18	SHALE	GENESEE FM	--	--	--	--	D	--	--
14	SHALE	GENESEE FM	--	--	--	--	D	--	--
46	FINE GRAINED SAND	--	--	--	--	--	D	--	--
--	SAND	--	--	--	--	--	D	--	--
23	SHALE	GENESEE FM	--	--	--	--	D	--	--
48	SAND	--	F	--	--	--	D	--	FLOWS 1 GPM AT LAND SURFACE
--	SAND	--	--	--	--	--	D	--	--
20	SHALE	GENESEE FM	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
64	COARSE GRAINED SAND	--	--	--	--	--	D	--	--
80	SAND AND GRAVEL	--	--	--	--	--	D	--	--
102	COARSE GRAINED SAND	--	--	--	--	--	D	--	--
97	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	F	--	--	--	D	--	--
96	SAND AND GRAVEL	--	F	--	--	--	D	--	--
92	SAND AND GRAVEL	--	--	--	--	--	D	--	--
92	SAND AND GRAVEL	--	--	--	--	--	D	--	--
54	SILTY SAND	--	--	--	--	--	D	--	--
36	SHALE	GENESEE FM	--	--	--	--	D	--	--
--	TILL	--	15	9-65	--	--	--	--	--
33	SHALE	GENESEE FM	--	--	--	--	D	--	--
8	SHALE	GENESEE FM	16	--	.6	--	D	--	--
12	SHALE	GENESEE FM	7	--	2	--	D	--	H_2S
--	SAND AND GRAVEL	--	F	8-66	--	--	--	C	GAS
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
28	SHALE	GENESEE FM	--	--	--	--	D	--	--
60	SHALE	HAMILTON GR	--	--	--	--	--	P	--
30	SILTY SHALE	HAMILTON GR	30	--	2	--	D	--	--
10	SHALE	JAVA & WEST FALLS FM	55	-66	10	3	--	P	--
25	SHALE	GENESEE FM	104	--	--	--	--	P	--
20	SILTY SHALE	SONYEA FM	13	7-66	30	--	D	P	--
27	SHALE	SONYEA FM	8	--	12	3	--	--	--
--	SAND AND GRAVEL	--	F	--	3	--	D	--	--
108	SHALE	JAVA & WEST FALLS FM	50	--	2	--	D	--	H_2S
--	SAND AND GRAVEL	--	+12	--	70	--	D	--	GAS; WELL PARTIALLY FILLED
--	SAND AND GRAVEL	--	10	--	--	--	D	--	--
--	SAND AND GRAVEL	--	10	--	10	--	D	--	--
65	SHALE	HAMILTON GR	15	--	6	--	--	P	--
34	SHALE	GENESEE FM	--	--	--	--	D	--	--
--	CLAYEY SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	6	7-65	--	--	--	--	--
--	SAND AND GRAVEL	--	+7	10-63	30	--	D	P	SPEC. CAPACITY 3 GPM/FT
--	CLAYEY SAND AND GRAVEL	--	--	--	--	--	D	--	--
25	SHALE	GENESEE FM	--	--	--	--	--	C	--
25	TILL	--	9	--	--	--	--	P	--
40	SHALE	SONYEA FM	16	7-65	--	--	--	--	--
40	SHALE	HAMILTON GR	--	--	1	--	D	--	SALTY
50	SHALE	SONYEA FM	--	--	--	--	--	P	--
--	SAND AND GRAVEL	--	3	2-65	40	--	D	P	SPEC. CAPACITY 1.3 GPM/FT
--	CLAYEY SAND AND GRAVEL	--	--	--	--	--	D	--	--
67	SAND AND GRAVEL	--	--	--	--	--	D	--	--
161	SHALE	GENESEE FM	--	--	--	--	D	--	--
85	SHALE	SONYEA FM	23	8-66	--	--	--	C	SAND IN WATER
100	SHALE	GENESEE FM	25	--	--	--	--	--	--

Table 5.--Records of selected wells and test holes in the Western Oswego River basin (Continued)

WELL NUMBER AND LOCATION	OWNER OR NAME	METHOD DRILLED	DATE DRILLED (YEAR)	WELL USE	WATER USE	WELL DEPTH (FT.)	CASING DEPTH (FT.)	CASING DIAMETER (IN.)	WELL FINISH	ALTITUDE OF LSD (FT.)
424407N0765359.1	NYS PARKS COMM	A	1960	--	--	135	--	6	X	580
424408N0770519.1	F ELLING	C	1942	W	I	160	100	6	X	1050
424411N0764119.1	A SPRAKER	C	1957	W	H	125	60	6	X	585
424412N0764036.1	H TWINING	C	1959	W	S	115	55	6	X	690
424413N0770521.1	E JENSEN	C	1932	U	U	72	72	6	O	1060
424414N0765336.1	NYS PARKS COMM	A	1960	--	--	467	15	6	X	590
424418N0765406.1	NYS PARKS COMM	A	1960	--	--	304	--	8	X	580
424426N0770137.1	LIBBY CO	C	1960	T	U	42	40	12	X	830
424427N0763133.1	H LANDON	C	1958	W	H	138	64	6	X	1300
424444N0770232.1	LIBBY CO	C	1960	T	U	300	--	8	X	880
424451N0770231.1	LIBBY CO	C	1960	T	U	22	19	12	X	870
424503N0771507.1	F TRICKEY	C	1953	W	--	97	85	6	X	810
424504N0770248.1	LIBBY CO	C	1960	T	U	22	19	12	X	850
424511N0771424.1	MIDDLESEX SCH	C	1938	Z	U	182	20	8	X	860
424530N0771953.1	H BLAKE	C	--	W	H	108	4	6	X	1050
424541N0771804.1	M WAITE	C	1950	W	--	125	15	6	X	900
424546N0763448.1	R BIRDSALL	C	1950	W	S	170	32	6	X	1060
424551N0764731.1	C HAYES	C	1966	W	H	22	17	6	X	610
424552N0765832.1	TOWN OF SENECA	C	1966	T	U	27	--	12	--	450
424553N0765820.1	TOWN OF SENECA	C	1966	T	U	67	--	12	S	450
424556N0765004.1	UNKNOWN	C	1965	W	H	50	21	6	X	690
424559N0764722.1	B VAN HOUTER	C	1966	W	H	76	17	6	X	590
424559N0765838.1	G SENNE	C	1955	W	H	96	50	6	X	480
424600N0765825.1	TOWN OF SENECA	C	1966	--	--	45	--	12	S	450
424607N0771928.1	G WELCH	C	1950	W	--	112	23	6	X	880
424616N0764611.1	E HAZARD	C	1940	W	H	137	137	6	D	390
424633N0770801.1	H THOMAS	C	--	W	S	138	55	6	X	1010
424650N0771531.1	F SCHLAGERTER	C	1936	W	S	240	54	6	X	1000
424703N0770737.1	F ADAMS	C	--	W	S	88	60	6	X	1000
424710N0770302.1	M REDMAN	C	1936	W	H	133	40	6	X	860
424720N0765041.1	G CAMPBELL	C	1965	W	H	40	18	6	X	680
424725N0771842.1	G MOUNTJOY	C	1948	W	H	119	23	6	X	740
424727N0765413.1	UNKNOWN	--	1965	W	H	75	7	6	X	570
424751N0770812.1	E PERRY	C	1949	W	H	47	47	6	D	890
424751N0770815.1	GORHAM SCHOOL	C	1936	W	T	75	75	4	O	900
424751N0770825.1	GORHAM SCHOOL	C	1955	W	T	31	26	4	G	890
424756N0770804.1	H TEECE	C	--	W	H	62	27	6	X	880
424807N0770751.1	LOHMANN FOODS	C	1949	W	N	125	35	6	X	900
424807N0770752.1	GRANDVIEW DAIRY	C	1951	U	U	340	--	6	X	920
424808N0770753.1	GRANDVIEW DAIRY	C	1945	U	U	204	35	6	X	895
424809N0764214.1	D PECK	C	1964	U	U	83	10	6	O	550
424809N0770029.1	G MOORE	C	1947	W	S	120	120	6	D	700
424810N0765837.1	MACCHAYNE	C	1965	W	H	61	61	6	D	485
424813N0764212.1	D PECK	C	1963	W	H	103	10	6	D	450
424813N0765832.1	J VANCE	C	1950	U	U	105	105	6	O	410
424828N0765043.1	E WARNE	C	1945	W	H	65	40	6	X	710
424830N0765003.1	L LITZENBERGER	C	1932	W	S	465	40	6	X	690
424833N0765247.1	SHEFFIELD FARMS	C	1945	W	N	75	28	6	X	610
424835N0770720.1	LOHMANN FOODS	C	1959	W	N	30	--	6	P	920
424835N0770721.1	LOHMANN FOODS	C	1961	W	N	48	32	12	X	920
424835N0770721.2	LOHMANN FOODS	--	--	U	U	29	20	6	--	920
424837N0764838.1	PAUL TROUT	C	1959	O	U	106	14	7	X	645
424837N0764839.1	PAUL TROUT	C	1959	D	U	290	16	7	X	645
424837N0770643.1	L PEDERSEN	C	1949	W	S	40	26	6	X	960
424842N0764510.1	L GARNSEY	C	1966	W	H	145	145	6	O	390
424850N0771534.1	P HORTON	C	1948	W	H	114	114	6	O	780
424851N0770250.1	A BRAWLEY	C	1947	W	H	85	57	6	X	850
424906N0771719.1	A TAYLOR	C	1951	W	H	64	10	6	X	700
424908N0771940.1	L QUAYLE	C	--	W	H	84	64	6	X	1020
424914N0771942.1	S STINARDO	C	--	W	H	26	17	6	X	1020
424946N0770735.1	M HEROD	C	--	W	H	110	110	6	D	860
424953N0772427.1	J DARCEY	--	1940	P	U	2175	2175	3	O	880
424956N0771526.1	E PLETSCH	C	1946	W	H	156	156	6	O	700
425001N0772002.1	W COLLINS	C	1950	W	H	205	42	6	X	1140
425007N0771659.1	M CASE	C	--	--	--	70	61	6	X	720
425010N0771522.1	J REISCH	C	1946	W	H	67	34	6	X	700
425014N0765253.1	F ROBSON	C	1965	W	H	86	10	6	X	605
425016N0771006.1	J DEPEW	C	--	W	S	139	13	6	X	970
425018N0763432.1	J GAGLIANESE	C	1959	W	H	96	50	6	X	960
425022N0772210.1	UNKNOWN	C	1965	U	U	130	26	6	X	1060
425027N0764144.1	ROTO SALT CO	C	1955	W	N	72	20	6	X	390
425032N0764605.1	D STUCK	C	1965	W	H	57	56	6	X	470
425035N0765056.1	C PAYNE	C	1965	W	H	50	12	6	X	580
425056N0764122.1	UNION SPS NY	C	1936	W	P	355	18	8	X	440
425057N0764122.1	UNION SPS NY	C	1965	W	P	160	--	8	X	440
425057N0765023.1	A POORMAN	C	1935	U	S	165	165	4	D	580
425058N0765223.1	H GRIPPEN	C	1965	W	H	130	10	6	X	585
425102N0765033.1	E FORMAN	C	1960	W	H	100	6	6	X	555
425105N0771520.1	J RANKIN	C	1953	W	--	98	27	6	X	705
425105N0771700.1	H MILLER	C	1948	W	H	133	133	6	D	770

DEPTH TO CONSL. ROCK (FT.)	WATER-BEARING MATERIAL	FORMATION	WATER LEVEL (FT.)	WATER LEVEL DATE MEAS.	YIELD (GPM)	YIELD (METHOD DETER-MINED)	LOG AVAIL-ABLE	QW TYPE	REMARKS
15	SHALE	HAMILTON GR	7	11-60	1	3	--	--	--
100	SHALE	GENESEE FM	20	--	--	--	--	--	--
60	SHALE	HAMILTON GR	--	--	--	--	--	C	--
55	SHALE	HAMILTON GR	--	--	--	--	--	P	--
--	SAND AND GRAVEL	--	18	--	--	--	D	--	--
13	CALCAREOUS SHALE	HAMILTON GR	--	--	1	3	D	--	--
15	SHALE	HAMILTON GR	8	11-60	5	3	--	--	--
40	SHALE	GENESEE FM	0	3-60	50	--	D	--	--
64	SHALE	GENESEE FM	53	10-66	2	3	--	C	--
34	SHALE	GENESEE FM	7	2-60	7	3	D	--	--
19	SHALE	GENESEE FM	--	--	--	--	D	--	--
85	SHALE	GENESEE FM	--	--	3	--	D	--	H_2S
19	SHALE	GENESEE FM	--	--	--	--	D	--	--
20	SHALE	GENESEE FM	--	--	12	--	D	--	--
4	SHALE	SONYEA FM	20	--	.5	--	D	--	--
15	SHALE	GENESEE FM	--	--	1	--	D	--	--
32	SHALE	HAMILTON GR	11	--	--	--	--	P	--
17	SHALE	HAMILTON GR	19	--	--	--	--	--	LARGE YIELD REPORTED
27	CLAYEY SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	6	2-66	420	--	D	--	SPEC. CAPACITY 262 GPM/FT
21	SHALE	HAMILTON GR	--	--	3	3	D	--	WATER AT TOP OF SHALE
7	SHALE	HAMILTON GR	--	--	1	3	D	--	WATER AT TOP OF SHALE
48	SHALE	HAMILTON GR	--	--	7	--	D	--	--
45	SAND AND GRAVEL	--	3	1-66	194	--	D	--	SPEC. CAPACITY 11.4 GPM/FT
23	SHALE	GENESEE FM	37	--	5	--	D	--	--
--	SAND	--	+30	--	10	--	--	P	--
55	SHALE	GENESEE FM	46	--	4	--	D	--	--
54	SHALE	GENESEE FM	30	--	.5	--	D	--	GAS FOUND WHILE DRILLING
60	SHALE	GENESEE FM	35	--	6	--	D	--	H_2S
38	SHALE	HAMILTON GR	--	--	1	--	D	--	--
18	SHALE	HAMILTON GR	11	5-65	--	--	--	--	--
20	SHALE	HAMILTON GR	--	--	10	--	D	--	H_2S
4	SHALE	HAMILTON GR	8	4-65	1	3	--	--	--
--	SAND AND GRAVEL	--	16	--	2	--	D	--	--
--	SAND	--	10	-36	15	--	--	C	H_2S
--	SAND AND GRAVEL	--	6	--	30	--	D	C	SPEC. CAPACITY 1.3 GPM/FT
26	SHALE	HAMILTON GR	12	--	2	--	D	--	--
35	LIMESTONE	TULLY LS	30	--	7	--	D	--	--
30	SHALE	HAMILTON GR	--	--	30	3	--	--	H_2S;GAS WHEN DRILLED
35	SHALE	HAMILTON GR	8	--	40	--	--	--	H_2S
10	SHALE	HAMILTON GR	--	--	--	--	--	--	--
--	SAND	--	10	--	20	--	D	C	--
--	SAND AND GRAVEL	--	37	8-65	9	3	--	--	--
10	SHALE	HAMILTON GR	--	--	2	3	--	C	--
--	SAND AND GRAVEL	--	16	--	20	--	D	--	--
16	SILTY SHALE	HAMILTON GR	20	--	60	--	D	P	--
20	LIMESTONE	ONONDAGA LS	40	--	1	--	D	--	H_2S
10	SHALE	HAMILTON GR	--	--	12	--	D	C	--
32	SAND	--	--	--	30	--	--	--	--
32	SHALE	GENESEE FM	1	--	50	--	D	--	WATER MAY BE DERIVED FROM SAND
--	SAND AND GRAVEL	--	F	4-66	--	--	--	P	IRON
15	SHALE	HAMILTON GR	4	5-65	2	3	--	C	OBS. WELL, 1965-1966
15	SHALE	HAMILTON GR	56	5-65	.5	3	--	C	GAS (?); OBS. WELL, 1965-1966
25	SHALE	GENESEE FM	3	--	2	--	D	--	--
--	SAND	--	F	--	--	--	--	C	SALTY
--	SAND	--	30	--	16	--	D	--	--
57	SHALE	HAMILTON GR	20	--	1	--	D	--	--
9	SHALE	HAMILTON GR	10	--	15	--	D	--	--
64	SHALE	GENESEE FM	20	--	1	--	D	--	GAS WHEN DRILLED
15	SHALE	GENESEE FM	6	--	4	--	D	P	--
--	SAND AND GRAVEL	--	32	--	4	--	D	--	--
78	CALCAREOUS SHALE	HAMILTON GR	--	--	--	--	D	--	GAS WELL
--	SAND AND GRAVEL	--	20	--	16	--	D	--	--
35	SHALE	GENESEE FM	13	--	3	--	D	--	H_2S; GAS WHEN DRILLED
60	SHALE	HAMILTON GR	F	--	15	--	D	--	H_2S
32	SHALE	HAMILTON GR	8	--	4	--	D	--	--
4	SHALE	HAMILTON GR	15	8-65	.25	3	--	--	--
13	SHALE	HAMILTON GR	39	--	10	--	D	--	--
50	SHALE	HAMILTON GR	20	--	10	3	--	--	--
25	SHALE	GENESEE FM	38	12-65	1	3	D	L	SALTY
20	LIMESTONE	ONONDAGA LS	0	--	60	--	--	P	--
23	LIMESTONE	ONONDAGA LS	12	5-65	8	3	--	--	--
5	SHALE	HAMILTON GR	10	--	3	3	--	--	--
10	LIMESTONE	ONONDAGA LS	--	--	100	--	--	P	WELL ALSO TAPS LOWER FM
8	LIMESTONE	ONONDAGA LS	32	--	310	--	--	--	--
5	LIMESTONE	ONONDAGA LS	128	--	15	--	D	P	--
10	SHALE	HAMILTON GR	25	2-65	2	3	D	--	--
6	SHALE	HAMILTON GR	--	--	--	--	--	--	--
26	SHALE	HAMILTON GR	24	--	2	--	O	--	--
--	SAND	--	7	--	25	--	D	--	--

Table 5.--Records of selected wells and test holes in the Western Oswego River basin (Continued)

WELL NUMBER AND LOCATION	OWNER OR NAME	METHOD DRILLED	DATE DRILLED (YEAR)	WELL USE	WATER USE	WELL DEPTH (FT.)	CASING DEPTH (FT.)	CASING DIAM-ETER (IN.)	WELL FINISH	ALTI-TUDE-OF LSD (FT.)
425125N0771507.1	G BAHRINGER	C	1948	W	H	45	45	6	O	700
425128N0770542.1	R NORRIS	C	1947	W	S	140	27	6	X	870
425130N0770147.1	P BULANDA	C	1945	W	S	105	100	6	--	740
425132N0770554.1	M BLEICH	C	1953	W	C	100	23	6	X	850
425138N0763429.1	E LARKIN	C	1945	W	H	262	18	6	X	910
425143N0770302.1	UNKNOWN	C	1946	U	U	120	120	6	O	790
425151N0770255.1	UNKNOWN	C	1947	U	U	213	192	6	X	765
425152N0765848.1	NYSDPW	--	1950	T	U	102	102	3	O	435
4252C0N0764451.1	F KELLER	D	--	U	U	22	--	26	W	415
425208N0765843.1	NYSDPW	--	1950	T	U	91	91	3	O	443
425211N0765909.1	NY TELEPHONE	C	--	Z	U	30	30	6	O	480
425218N0771423.1	NYSDPW	W	1953	T	U	19	--	2	X	735
425220N0771504.1	K SMITH	C	1948	W	C	35	35	6	O	700
425225N0771738.1	H NORTH	C	1952	W	--	50	50	6	O	840
425227N0771733.1	B MERSON	C	1950	--	W	60	60	6	D	820
425229N0765657.1	WATERLOO NY	C	1946	T	U	135	135	8	O	450
425229N0771734.1	L SMITH	C	1950	W	--	38	38	6	D	810
425232N0771504.1	NYSDPW	--	1953	T	U	42	--	2	O	685
425235N0765812.1	A TARR	C	1933	W	N	135	135	6	O	460
425237N0765712.1	NYS ELEC AND G	C	1927	Z	U	336	200	8	X	450
425239N0771619.1	LEAMING IND INC	C	1966	W	N	48	38	16	G	690
425239N0772323.1	G MURRAY	C	1952	W	S	28	28	6	O	880
425245N0765729.1	H NERBER	C	1946	W	C	135	135	6	O	460
425245N0765746.1	WATERLOO NY	C	1946	T	U	127	127	8	O	465
425246N0764906.1	SENECA CO HOME	C	--	W	T	93	6	6	X	480
425255N0770142.1	J WHITE	C	1949	W	H	104	76	6	X	680
425256N0765614.1	W REGAL	C	1947	W	H	113	110	6	X	460
425256N0772144.1	H CLAUS	C	1951	W	C	185	107	6	X	930
425304N0772440.1	K CLUTTER	C	1952	W	--	50	22	6	X	945
425310N0765547.1	R CONWAY	C	1946	W	H	87	87	6	O	460
425311N0770436.1	SOPER BROS	C	1933	W	S	285	30	6	X	760
425314N0765548.1	J TARR	C	1946	O	U	76	84	6	O	460
425321N0764511.1	SENECA FALLS CC	C	1964	W	I	109	42	6	X	450
425331N0763459.1	F RIESTER	C	1960	W	H	101	91	6	X	750
425341N0765437.1	J KIERST	C	1962	W	H	53	53	6	O	450
425342N0765657.1	J CLISE	C	--	W	S	268	268	6	O	475
425343N0765528.1	UNKNOWN	D	--	U	U	14	--	--	W	470
425343N0765654.1	UNKNOWN	D	--	U	U	13	--	30	W	470
425344N0765524.1	WATERLOO NY	C	1946	T	U	125	115	8	X	465
425349N0764034.1	BACON	C	1936	W	S	75	30	6	O	535
425352N0765407.1	C ALAIR	C	--	U	U	127	127	6	O	470
425352N0765407.2	C ALAIR	C	1959	W	H	96	96	6	O	470
425352N0765553.1	WATERLOO NY	C	1946	T	U	116	106	8	X	475
425353N0765401.1	W HART	C	1915	W	H	97	97	6	O	470
425358N0771507.1	W PUTMAN	C	1948	W	H	130	101	6	X	700
425359N0765315.1	UNKNOWN	C	1966	W	H	59	59	6	O	460
425401N0765329.1	J ONEAL	C	1950	W	C	65	65	6	O	440
425401N0765627.1	WATERLOO NY	C	1946	T	U	140	125	8	X	480
425401N0770148.1	C TRICKLER	C	1949	W	S	175	36	6	X	630
425402N0765309.1	H PIERIE	C	1966	W	H	64	64	6	X	470
425403N0765110.1	EVANS COSMETIC	C	1964	W	N	130	52	12	P	440
425406N0765646.1	H COOK	C	1928	W	H	225	200	6	X	480
425406N0772800.1	P FLEMING	C	1948	W	C	220	220	6	O	1000
425408N0765000.1	R KARWECK	C	1963	W	C	66	--	8	X	450
425408N0765004.1	R KARWECK	C	1951	W	C	96	--	8	X	440
425408N0771541.1	R WHEELER	C	1946	W	H	178	118	6	X	745
425409N0765707.1	WATERLOO NY	C	1946	T	U	202	196	6	S	480
425409N0770039.1	M VANSICKEL	C	1936	W	C	66	27	6	X	550
425411N0765948.1	V CARDINELE	C	1954	W	H	82	18	6	X	500
425411N0772607.1	L NEENAN	C	1955	W	H	23	23	6	O	900
425414N0764948.1	UNKNOWN	C	1947	W	H	56	52	6	X	450
425414N0765723.1	WATERLOO NY	C	1946	T	U	175	152	6	S	480
425415N0772804.1	L BENNETT	C	1951	W	H	82	82	6	O	980
425418N0765328.1	J HEMMINGER	C	1940	W	H	70	70	6	O	460
425420N0765329.1	G GOODMAN	D	--	W	H	11	11	24	W	470
425421N0765733.1	CRYST	C	--	W	H	187	187	4	O	485
425423N0765331.1	M GOODMAN	C	--	W	H	65	40	6	X	460
425429N0764922.1	SOUHAN DAIRY	C	1937	Z	U	50	46	6	X	450
425430N0771753.1	W CLAPPER	C	1937	W	C	19	19	6	O	780
425431N0765100.1	WATERLOO NY	C	1946	T	U	65	59	10	X	470
425433N0765117.1	GREENWOOD FOODS	C	1948	U	U	82	56	6	X	470
425433N0765120.1	GREENWOOD FOODS	A	1959	W	N	206	62	6	X	460
425434N0765122.1	GREENWOOD FOODS	C	1948	W	N	75	55	8	X	470
425435N0765011.1	L NORCOTT	C	--	W	S	190	60	6	X	470
425440N0770044.1	H FIELDS	C	1949	W	H	38	38	6	O	550
425442N0765925.1	D ZETTLEMOYER	C	1965	W	H	69	69	6	O	475
425449N0765138.1	WATERLOO NY	C	1946	T	U	40	23	10	X	485
425449N0771808.1	D FRANCHIONE	C	1956	W	H	61	53	6	X	770
425450N0765118.1	J HEIERMAN	C	1942	W	H	75	65	6	X	480
425450N0771423.1	H BURGESS	C	1949	W	H	65	41	6	X	710

DEPTH TO CONSL. ROCK (FT.	WATER-BEARING MATERIAL	FORMATION	WATER LEVEL (FT.)	WATER LEVEL DATE MEAS.	YIELD GPM)	YIELD (METHOD DETER-MINED)	LOG AVAIL-ABLE	QW TYPE	REMARKS
--	SAND AND GRAVEL	--	24	--	20	--	D	--	--
27	SHALE	HAMILTON GR	40	--	7	--	D	--	H_2S
--	SAND AND GRAVEL	--	10	--	32	--	--	--	--
18	SHALE	HAMILTON GR	10	--	1	--	D	--	--
18	SHALE	HAMILTON GR	30	--	10	--	D	L	--
190	SAND	--	--	--	15	--	--	--	--
190	SHALE	HAMILTON GR	100	--	--	--	D	--	--
--	SILTY SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	TILL	--	9	4-65	--	--	--	--	--
--	SAND	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	--	--	15	--	D	--	--
1	SHALE	HAMILTON GR	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	12	--	30	--	D	--	--
--	SAND AND GRAVEL	--	15	--	10	--	D	--	--
--	SAND AND GRAVEL	--	28	--	16	--	D	--	--
--	GRAVELLY CLAY	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	10	--	12	--	D	--	--
--	SILT	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	10	--	7	--	D	P	--
200	CALCAREOUS SHALE	CAMILLUS SH	F	--	11	--	D	--	H_2S
--	SAND AND GRAVEL	--	2	6-66	140	1	D	C	SPEC. CAPACITY 7.3 GPM/FT
--	SAND AND GRAVEL	--	F	--	10	--	D	--	IRON
--	SAND AND GRAVEL	--	10	--	50	--	D	--	--
--	SAND	--	--	--	--	--	D	--	--
3	LIMESTONE	ONONDAGA LS	20	--	60	--	--	C	--
65	SHALE	HAMILTON GR	20	--	2	--	D	--	H_2S
110	LIMESTONE	ONONDAGA LS	9	--	30	--	D	--	--
107	SHALE	HAMILTON GR	85	--	.5	--	D	--	--
22	SHALE	HAMILTON GR	0	--	1	--	D	--	--
--	SAND AND GRAVEL	--	9	--	50	--	D	C	--
5	SHALE	HAMILTON GR	5	--	25	--	D	--	H_2S; ALSO TAPS ONONDAGA LS
--	SAND AND GRAVEL	--	9	7-65	60	3	D	--	OBS. WELL 1965-1966
42	SHALY DOLOMITE	CAMILLUS SH	25	8-64	50	3	D	C	--
91	SHALE	HAMILTON GR	42	9-60	4	3	--	L	TURBID
53	LIMESTONE	ONONDAGA LS	5	--	32	3	--	C	--
--	SAND AND GRAVEL	--	28	--	75	--	D	P	--
--	SAND	--	1	4-66	--	--	--	--	--
--	SAND	--	10	--	--	--	--	--	--
118	CLAYEY SAND AND GRAVEL	--	--	--	5	--	D	--	ALSO TAPS ONONDAGA LS
30	CALCAREOUS SHALE	SILURIAN CARBONATE RK	50	--	--	--	--	C	--
--	SAND AND GRAVEL	--	--	--	--	--	--	--	POOR QUALITY REPORTED
--	SAND	--	33	--	--	--	--	--	--
112	LIMESTONE	ONONDAGA LS	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	59	--	30	--	D	P	--
100	SHALE	HAMILTON GR	22	--	3	--	D	P	--
63	SAND AND GRAVEL	--	18	9-66	18	3	D	--	FINE SAND IN WATER
--	SILTY SAND	--	--	--	--	--	--	--	--
135	LIMESTONE	ONONDAGA LS	--	--	--	--	D	--	--
35	LIMESTONE	ONONDAGA LS	100	--	20	--	D	--	SPEC. CAPACITY 20 GPM/FT
64	LIMESTONE	ONONDAGA LS	21	6-66	--	--	D	--	--
37	SHALY LIMESTONE	SILURIAN CARBONATE RK	8	6-64	450	--	D	P	SPEC. CAPACITY 23 GPM/FT
218	LIMESTONE	ONONDAGA LS	35	--	2	--	D	--	--
--	SAND AND GRAVEL	--	100	--	6	--	D	--	--
--	LIMESTONE	ONONDAGA LS	--	--	60	3	--	--	--
--	LIMESTONE	SILURIAN CARBONATE RK	--	--	80	--	--	C	H_2S
117	SHALE	HAMILTON GR	20	--	1	--	D	--	--
--	SAND AND GRAVEL	--	23	6-46	225	--	D	--	SPEC. CAPACITY 112 GPM/FT
16	LIMESTONE	ONONDAGA LS	--	--	--	--	--	--	--
18	LIMESTONE	ONONDAGA LS	30	--	10	--	D	--	--
--	SAND AND GRAVEL	--	F	--	--	--	D	--	--
40	SHALY DOLOMITE	SILURIAN CARBONATE RK	20	--	4	--	D	--	--
--	SAND AND GRAVEL	--	16	7-46	230	--	D	--	SPEC. CAPACITY 38 GPM/FT
--	SAND AND GRAVEL	--	35	--	4	--	D	--	--
--	SAND AND GRAVEL	--	16	--	--	--	--	P	--
--	SAND	--	2	4-66	--	--	--	--	--
--	SAND	--	20	--	50	--	D	P	--
40	LIMESTONE	ONONDAGA LS	12	2-66	5	3	D	P	--
45	SHALY DOLOMITE	SILURIAN CARBONATE RK	20	--	15	--	--	P	H_2S
--	SAND AND GRAVEL	--	5	--	2	--	D	--	--
59	CLAYEY SAND AND GRAVEL	--	--	--	--	--	D	--	--
56	LIMESTONE	ONONDAGA LS	23	6-48	75	--	D	--	--
62	SHALY LIMESTONE	SILURIAN CARBONATE RK	5	8-59	130	--	--	--	GAS WHEN DRILLED
55	LIMESTONE	ONONDAGA LS	30	7-48	200	--	--	P	--
40	LIMESTONE	ONONDAGA LS	--	--	10	--	D	--	--
--	SAND AND GRAVEL	--	10	--	2	--	D	--	--
--	SAND AND GRAVEL	--	11	10-65	25	3	D	--	--
23	LIMESTONE	ONONDAGA LS	--	--	--	--	D	--	--
51	SHALE	HAMILTON GR	2	--	40	--	D	--	H_2S
25	LIMESTONE	ONONDAGA LS	27	--	7	--	D	--	IRON
42	SHALE	HAMILTON GR	25	--	5	--	D	--	--

Table 5.--Records of selected wells and test holes in the Western Oswego River basin (Continued)

WELL NUMBER AND LOCATION	OWNER OR NAME	METHOD DRILLED	DATE DRILLED (YEAR)	WELL USE	WATER USE	WELL DEPTH (FT.)	CASING DEPTH (FT.)	CASING DIAM-ETER (IN.)	WELL FINISH	ALTI-TUDE OF LSD (FT.)
425452N0765759.1	E OUGHTERSON	C	1965	W	H	135	132	6	X	470
425458N0771415.1	A BURT SR	C	1952	W	—	39	39	6	O	710
425503N0765505.1	J CUSON	C	1960	W	H	101	99	6	X	480
425503N0765952.1	A W HALL	—	1943	W	H	30	17	6	X	480
425505N0765114.1	WATERLOO NY	C	1946	T	U	88	61	10	X	490
425505N0771407.1	P WALKER	C	1949	W	H	130	58	6	X	705
425506N0765418.1	W PAINE	C	1943	W	H	117	117	6	O	480
425509N0765840.1	C SKINNER	C	1963	W	H	75	75	6	O	470
425511N0765609.1	E THOMAS	C	1965	W	H	235	106	6	X	480
425511N0765843.1	J OBRIEN	C	1944	W	H	141	141	6	X	475
425513N0771822.1	E JOHNSON	C	1955	W	H	118	38	6	X	785
425520N0772504.1	I ERKENZ	C	1964	W	H	103	--	6	O	980
425524N0771913.1	KANANDAGUA GOLF	C	1963	W	I	292	20	12	X	770
425529N0765425.1	W CORNER	C	1943	W	H	112	111	6	X	510
425531N0771828.1	P TUTTLE	C	1949	W	H	110	29	—	X	780
425534N0771704.1	F SCHRADER	C	1952	W	H	62	62	6	O	780
425536N0772806.1	FAIRPORT NY	H	1965	W	P	80	80	6	O	910
425537N0764707.1	C CROSS	C	1947	W	H	111	45	6	X	460
425537N0770000.1	N WALKER	C	1947	W	H	87	87	6	O	470
425541N0765506.1	E SKINNER	C	1945	W	H	100	100	6	O	510
425543N0772810.1	L BENNETT	C	1950	W	H	98	98	6	O	910
425552N0772913.1	H SANDERS	C	1939	W	H	206	201	6	X	900
425556N0765747.1	F RACINE	C	—	U	U	175	178	6	O	530
425558N0765912.1	G YANCEY	C	1945	W	H	60	60	6	O	470
425558N0770046.1	E M CLAXTON	C	1946	W	H	36	36	6	O	490
425601N0765840.1	G DROOBY	C	1945	W	H	153	153	6	O	485
425602N0765030.1	J LAMANNA	C	--	W	H	85	30	6	X	480
425602N0765949.1	C BROWN	C	1953	W	H	66	66	6	O	460
425603N0763921.1	J POLLARD	D	—	U	U	22	--	36	W	520
425604N0763921.1	J POLLARD	C	1930	W	H	100	--	6	X	520
425607N0764859.1	G PERROTTO	C	1965	W	H	60	42	6	X	490
425608N0763955.1	J PIELUSZCZAK	C	—	W	C	33	—	6	X	500
425608N0765735.1	WATERLOO NY	C	1946	T	U	130	56	8	S	500
425611N0772143.1	H PURDY	C	1952	W	S	145	75	6	X	750
425614N0764630.1	R PETERSON	A	1960	W	C	30	30	6	X	420
425615N0764903.1	E SAUNDERS	C	--	W	S	158	45	6	X	485
425616N0764059.1	C HALL	C	1947	W	C	104	23	6	X	500
425618N0764625.1	GUARANTEED CO	C	1946	U	U	39	39	8	O	430
425620N0764628.1	HEDDENS MOTEL	C	1935	W	C	140	44	6	X	435
425620N0771332.1	R NUDD	C	1951	W	S	70	55	6	X	680
425621N0764151.1	J MULLEN	C	1958	W	H	100	--	—	—	540
425621N0765752.1	R HURLBURT	C	1951	W	H	170	125	6	X	535
425622N0765127.1	R DIXON	C	1964	W	H	70	56	6	X	480
425624N0765756.1	A ROSE	C	1965	W	H	212	104	6	X	530
425625N0765758.1	H OSBORNE	C	1954	W	H	120	118	6	X	540
425628N0771639.1	E KENT	C	—	W	H	65	65	6	O	670
425629N0764743.1	R DEMING	C	1946	W	S	147	33	6	X	500
425634N0771329.1	SHORTSVILLE NY	C	1944	W	P	81	15	8	X	670
425635N0771327.1	SHORTSVILLE NY	C	—	W	P	105	--	6	X	650
425635N0771330.1	SHORTSVILLE NY	C	1942	W	P	70	16	8	X	675
425636N0771328.1	SHORTSVILLE NY	C	—	U	U	88	28	5	X	660
425637N0771329.1	SHORTSVILLE N Y	C	1934	W	P	83	16	8	X	665
425638N0771307.1	NORTH	C	—	W	H	29	8	6	X	670
425639N0770819.1	CLIFTON SPS CC	C	1965	W	H	65	—	6	X	685
425640N0771110.1	H LYTLE	C	1954	W	—	30	24	6	X	690
425640N0771347.1	P HAYES	C	1965	W	H	21	18	6	X	650
425640N0771951.1	L FULLER	C	1952	W	—	52	25	6	X	700
425641N0764045.1	P SCHMELZLE	D	—	W	H	18	—	24	W	580
425641N0771347.1	P HAYES	C	1965	W	H	21	14	6	X	650
425642N0770755.1	CLIFTON SPS CC	A	1965	W	I	52	23	6	X	640
425643N0764045.1	W SCHMELZLE	C	1953	W	H	225	--	6	X	580
425643N0771007.1	H GIBBS	C	1946	W	H	28	16	6	X	675
425648N0764238.1	F BOWERS	D	—	W	H	30	—	48	W	480
425648N0771332.1	E BRAHM	C	1948	W	H	45	33	6	X	620
425649N0770051.1	L GREEN	C	1953	W	C	69	69	6	O	460
425650N0764519.1	G MILLER	C	1966	W	C	55	55	8	O	450
425652N0764747.1	C SHUSTER	C	1963	W	S	201	40	6	X	520
425656N0765236.1	R ELLISON	C	1960	W	H	67	57	6	X	490
425708N0770037.1	B DERUYTER	C	1947	W	H	93	81	6	X	490
425708N0772446.1	C SOUTHGATE	C	1954	W	—	175	149	6	X	805
425710N0765734.1	C COON	A	1956	W	H	96	93	6	X	540
425712N0765652.1	F GOELLNER	C	1963	W	H	66	66	6	O	490
425713N0764112.1	UNKNOWN	C	1966	W	H	106	15	6	X	500
425714N0771456.1	J MASLYN	C	1955	W	—	26	26	6	O	630
425715N0772811.1	D DONOVAN	C	1949	W	S	181	181	6	O	870
425717N0765828.1	NYS THRUWAY AUT	W	1952	T	U	52	52	3	X	485
425717N0765840.1	NYS THRUWAY AUT	W	1952	T	U	52	—	3	X	480
425717N0765854.1	NYS THRUWAY AUT	W	1955	T	U	56	—	3	X	430
425717N0765924.1	NYS THRUWAY AUT	W	1952	T	U	55	—	3	X	425
425719N0770045.1	NYS THRUWAY AUT	—	1952	T	U	80	—	3	X	495

DEPTH TO CONSL. ROCKL. (FT.)	WATER-BEARING MATERIAL	FORMATION	WATER LEVEL (FT.)	WATER LEVEL DATE MEAS.	YIELD (GPM)	YIELD (METHOD DETER-MINED)	LOG AVAIL-ABLE	QW TYPE	REMARKS
132	CALCAREOUS SHALE	CAMILLUS SH	--	--	10	3	--	C	SALTY
--	SAND	--	9	--	20	--	D	--	--
--	SAND AND GRAVEL	--	10	--	--	--	D	P	--
17	LIMESTONE	ONONDAGA LS	27	--	10	--	D	P	--
60	LIMESTONE	ONONDAGA LS	41	3-46	43	--	D	P	--
56	SHALE	HAMILTON GR	25	--	--	--	D	P	--
--	SAND AND GRAVEL	--	24	--	15	--	D	--	--
--	SAND	--	15	--	20	--	D	--	--
106	SHALY LIMESTONE	SILURIAN CARBONATE RK	4	--	36	--	--	C	IRON --
--	SAND	--	20	--	50	--	D	--	IRON
38	SHALE	HAMILTON GR	15	--	1	--	D	--	H_2S
--	SHALE	HAMILTON GR	63	4-66	10	--	--	--	--
26	LIMESTONE	ONONDAGA LS	105	9-63	197	--	D	C	H_2S; ALSO TAPS HAMILTON GR
--	SAND AND GRAVEL	--	20	--	10	--	D	--	WATER REPORTED "MINERALIZED"
29	LIMESTONE	ONONDAGA LS	50	--	30	--	D	P	--
--	SAND	--	10	--	10	--	D	--	--
--	SAND AND GRAVEL	--	F	6-66	250	--	D	C	--
44	SHALY DOLOMITE	SILURIAN CARBONATE RK	18	--	--	--	D	--	--
--	SAND AND GRAVEL	--	20	--	40	--	D	--	--
--	SAND	--	10	--	15	--	D	--	--
--	SAND AND GRAVEL	--	F	--	20	--	D	--	--
--	SAND AND GRAVEL	--	44	--	5	--	D	--	--
--	SAND AND GRAVEL	--	76	4-66	30	--	D	P	PARTIALLY FILLED
--	SAND AND GRAVEL	--	35	--	8	--	D	P	IRON
36	SAND AND GRAVEL	--	--	--	--	--	--	P	--
140	SHALY DOLOMITE	SILURIAN CARBONATE RK	16	--	50	--	D	--	--
30	SHALY LIMESTONE	SILURIAN CARBONATE RK	20	--	50	--	D	P	--
--	SAND AND GRAVEL	--	34	--	20	--	D	C	--
--	TILL	--	10	9-59	--	--	--	--	--
--	SHALE	CAMILLUS SH	22	--	--	--	--	J	--
42	SHALY DOLOMITE	SILURIAN CARBONATE RK	13	9-65	35	3	D	P	--
--	SHALE	CAMILLUS SH	2	9-60	5	--	--	L	IRON
--	SAND AND GRAVEL	--	26	10-46	65	--	D	P	SPEC. CAPACITY 10.9 GPM/FT
75	LIMESTONE	ONONDAGA LS	--	--	10	--	D	--	--
25	DOLOMITE	SILURIAN CARBONATE RK	6	--	--	--	--	P	H_2S
33	SHALY DOLOMITE	SILURIAN CARBONATE RK	19	--	15	--	D	P	ALSO TAPS CAMILLUS SH
23	SHALE	CAMILLUS SH	20	--	5	3	--	L	IRON; "POOR" TASTE
--	SAND AND GRAVEL	--	23	8-66	8	3	D	--	--
44	SHALE	CAMILLUS SH	30	--	60	--	--	--	--
30	LIMESTONE	ONONDAGA LS	--	--	3	--	D	--	--
--	SHALE	CAMILLUS SH	--	--	--	--	--	J	--
123	CALCAREOUS SHALE	CAMILLUS SH	90	--	1	--	D	--	H_2S; ALSO TAPS SIL. CARBONATE RK
55	SHALY DOLOMITE	SILURIAN CARBONATE RK	8	8-64	15	3	D	P	WHITE PRECIPITATE IN WATER
104	SHALY LIMESTONE	SILURIAN CARBONATE RK	--	--	12	3	--	C	H_2S
115	DOLOMITE	SILURIAN CARBONATE RK	73	--	2	--	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	--	P	--
30	CALCAREOUS SHALE	CAMILLUS SH	50	--	20	--	D	P	--
19	LIMESTONE	ONONDAGA LS	--	--	62	--	D	P	H_2S; SLIGHTLY TURBID
15	LIMESTONE	ONONDAGA LS	21	6-65	150	--	--	P	H_2S
16	LIMESTONE	ONONDAGA LS	--	--	100	--	--	P	--
25	CHERTY LIMESTONE	ONONDAGA LS	27	6-65	--	--	--	--	--
15	LIMESTONE	ONONDAGA LS	23	--	52	--	--	P	H_2S
8	LIMESTONE	ONONDAGA LS	9	--	5	--	D	P	--
4	LIMESTONE	ONONDAGA LS	20	--	30	3	--	--	--
24	LIMESTONE	ONONDAGA LS	15	--	10	--	D	--	--
17	CHERTY LIMESTONE	ONONDAGA LS	7	4-65	--	--	--	--	--
25	LIMESTONE	ONONDAGA LS	2	--	H	--	D	--	--
--	TILL	--	8	7-59	--	--	--	J	SOMETIMES GOES DRY
14	CHERTY LIMESTONE	ONONDAGA LS	7	4-65	--	--	--	--	--
12	LIMESTONE	ONONDAGA LS	19	9-66	50	3	D	--	--
--	SHALE	CAMILLUS SH	75	--	15	3	--	L	IRON
15	LIMESTONE	ONONDAGA LS	10	--	25	--	D	--	--
--	TILL	--	6	7-59	--	--	--	J	--
--	LIMESTONE	ONONDAGA LS	11	--	20	--	D	--	--
--	SAND AND GRAVEL	--	30	4-66	15	--	D	--	--
55	SAND AND GRAVEL	--	--	--	50	3	--	--	--
40	SHALE	CAMILLUS SH	65	--	10	--	--	P	--
57	SHALY DOLOMITE	SILURIAN CARBONATE RK	10	9-60	30	--	--	P	-
80	LIMESTONE	SILURIAN CARBONATE RK	56	9-47	50	--	D	--	--
148	LIMESTONE	ONONDAGA LS	85	--	4	--	D	--	--
93	SHALY DOLOMITE	SILURIAN CARBONATE RK	30	9-56	5	--	--	C	IRON
--	SAND AND GRAVEL	--	16	8-63	40	3	--	C	--
15	SHALE	CAMILLUS SH	10	8-66	--	--	--	--	--
--	SAND AND GRAVEL	--	9	--	10	--	D	--	--
--	SAND	--	65	--	30	--	D	--	--
--	SILTY SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND	--	--	--	--	--	D	--	--
51	SHALY DOLOMITE	SILURIAN CARBONATE RK	5	6-52	--	--	D	--	--
47	SAND AND GRAVEL	--	--	--	--	--	D	--	--
61	SILTY SAND AND GRAVEL	--	--	--	--	--	D	--	--

Table 5.--Records of selected wells and test holes in the Western Oswego River basin (Continued)

WELL NUMBER AND LOCATION	OWNER OR NAME	METHOD DRILLED	DATE DRILLED (YEAR)	WELL USE	WATER USE	WELL DEPTH (FT.)	CASING DEPTH (FT.)	CASING DIAMETER (IN.)	WELL FINISH	ALTITUDE OF LSD (FT.)
425720N0770806.1	CLIFTON SPS SAN	C	1929	W	T	75	20	6	X	610
425720N0770810.1	CLIFTON SPS SAN	C	1929	W	T	65	20	6	X	635
425727N0772035.1	E BLAZEY	C	1944	W	C	31	17	6	X	680
425728N0765253.1	M GRABATIN	C	1961	W	H	25	14	6	X	500
425728N0765530.1	NYS THRUWAY AUT	W	--	T	U	26	--	3	X	495
425728N0770358.1	EMPIRE PICKLING	C	1927	U	U	225	12	6	X	540
425729N0771906.1	A SMITH	C	1949	W	H	31	15	6	X	660
425730N0770403.1	EMPIRE PICKLING	C	--	W	N	400	19	8	X	540
425731N0765614.1	NYS THRUWAY AUT	W	--	T	U	46	--	3	X	495
425731N0772557.1	A BROWN	C	1951	W	--	67	63	6	X	715
425732N0770359.1	EMPIRE PICKLING	C	1956	U	U	26	19	6	X	540
425732N0770400.1	EMPIRE PICKLING	C	1956	W	N	28	19	8	X	540
425732N0771719.1	K WHITTAKER	D	--	W	H	20	20	36	W	650
425732N0771737.1	S ENGLISH	C	1956	W	H	30	30	6	O	650
425733N0765418.1	NYS THRUWAY AUT	W	--	T	U	50	50	3	O	505
425737N0772447.1	C MAPES	C	1954	W	--	158	84	4	X	820
425738N0770948.1	R TEARS	C	1949	W	S	31	30	6	X	600
425740N0765041.1	B SMITH	A	1962	W	H	70	30	6	X	510
425740N0765117.1	W SISSON	A	1963	W	H	63	20	6	X	510
425741N0765038.1	A SCHWIETZ	A	1965	W	H	80	33	6	X	520
425741N0772355.1	H PIERCE	C	1953	W	--	58	58	6	O	690
425742N0770615.1	HUTCHINSON	C	1953	W	H	42	35	6	X	600
425744N0770233.1	NYS THRUWAY AUT	W	1952	T	U	48	--	3	X	490
425746N0770502.1	SUPER DUPER MKT	C	1964	W	H	39	21	6	X	570
425746N0770805.1	CLIFTON SPS SAN	C	1922	U	U	65	20	6	X	570
425750N0765254.1	NYS THRUWAY AUT	W	--	T	U	23	21	3	X	515
425751N0770020.1	D HALL	C	1949	W	S	54	54	6	O	505
425753N0765741.1	G GREEN	C	1965	W	H	63	61	6	X	500
425754N0765652.1	K SHERADIN	C	1966	W	H	81	81	6	O	480
425755N0765156.1	NYS THRUWAY AUT	W	--	T	U	32	32	3	O	505
425756N0764426.1	MONT WILDLIFE R	C	1940	U	U	705	165	4	X	390
425756N0770051.1	F MASYLN	C	1949	W	S	43	43	6	O	505
425759N0771642.1	H WALKER	C	1944	W	H	28	28	6	O	610
425801N0771514.1	MANCHESTER NY	C	1951	U	U	27	--	12	S	610
425802N0771512.1	MANCHESTER N Y	D	1916	W	P	15	15	420	O	605
425802N0771609.1	E GOVERNOR	C	1959	W	H	34	18	6	X	600
425802N0771644.1	E ZUCK	D	1965	W	C	8	--	30	W	600
425803N0765051.1	NYS THRUWAY AUT	W	--	T	U	30	--	3	X	515
425803N0771749.1	R REDFIELD	C	--	W	H	37	37	6	O	630
425804N0770327.1	NYS THRUWAY AUT	--	1952	T	U	52	--	3	X	490
425805N0771640.1	J BROWN	D	1857	W	H	21	--	30	W	600
425806N0770048.1	W LAMBERT	C	1963	W	H	96	91	6	X	540
425806N0770339.1	NYS THRUWAY AUT	--	1952	T	U	28	--	3	X	460
425810N0764944.1	NYS THRUWAY AUT	W	--	T	U	23	--	3	X	477
425810N0770433.1	NYS THRUWAY AUT	--	1951	T	U	26	--	3	X	550
425812N0770920.1	D CROUCHER	D	1966	W	H	16	--	48	W	550
425816N0770450.1	NYS THRUWAY AUT	W	1952	T	U	17	--	4	X	550
425817N0770828.1	EVERSON DAIRY	C	1961	W	H	64	34	6	X	545
425819N0764902.1	NYS THRUWAY AUT	W	--	T	U	27	--	3	X	495
425820N0772332.1	J PAPARONNE	C	1963	W	H	48	42	7	X	570
425823N0771038.1	NYS THRUWAY AUT	C	1953	T	U	51	26	6	X	550
425823N0771056.1	NYS THRUWAY AUT	C	1953	T	U	50	--	--	X	530
425824N0770930.1	NYS THRUWAY AUT	--	1952	T	U	30	--	4	X	525
425824N0771056.1	NYS THRUWAY AUT	C	1953	T	U	100	27	6	X	490
425824N0771056.2	NYS THRUWAY AUT	C	1953	T	U	27	23	6	S	490
425824N0772100.1	E POTTER	C	1951	W	H	45	45	6	O	630
425825N0770828.1	NYS THRUWAY AUT	--	1951	T	U	36	--	3	X	525
425827N0771512.1	L BROPHY	C	1947	W	H	35	9	6	X	590
425829N0771049.1	NYS THRUWAY AUT	--	1952	T	U	21	--	4	X	540
425829N0771055.1	NYS THRUWAY AUT	--	1952	T	U	27	--	4	X	535
425830N0765544.1	D SMITH	C	--	W	H	71	71	6	O	490
425830N0772115.1	HUNT	C	1936	W	C	30	28	6	X	640
425835N0771257.1	NYS THRUWAY AUT	--	1952	T	U	22	--	4	X	545
425836N0765609.1	G SMITH	V	1965	W	H	10	8	2	T	470
425837N0772352.1	VICTOR NY	H	1961	T	U	23	--	6	X	555
425840N0765840.1	A OAKS	C	1954	W	H	40	29	6	X	470
425840N0771339.1	NYS THRUWAY AUT	C	1953	O	U	139	11	6	X	555
425842N0771332.1	NYS THRUWAY AUT	--	1952	T	U	33	--	3	X	555
425843N0770711.1	EVERSON DAIRY	C	--	W	H	93	38	6	X	540
425845N0771359.1	NYS THRUWAY AUT	--	1952	T	U	24	--	4	X	555
425846N0770725.1	EVERSON DAIRY	C	--	W	H	61	--	6	X	540
425847N0764754.1	NYS THRUWAY AUT	W	--	Z	U	25	--	3	X	445
425847N0770735.1	EVERSON DAIRY	C	--	W	H	82	--	6	X	540
425855N0771638.1	NYS THRUWAY AUT	--	1951	T	U	26	--	4	X	580
425859N0765411.1	J WYATT	C	1966	W	H	21	11	6	O	490
425906N0765312.1	G PEARSON	C	1962	W	H	100	38	6	X	530
425912N0772148.1	NYS THRUWAY AUT	W	1946	T	U	33	10	4	X	585
425916N0764615.1	MONT WILDLIFE R	C	1947	Z	U	100	--	6	O	385
425922N0764159.1	W HARRIS	D	--	W	H	29	--	30	W	460
425923N0765414.1	S FELLOWS	C	1943	W	S	121	30	6	X	510
425925N0770823.1	E SCHANZ	C	1949	W	H	57	53	6	X	580

DEPTH TO CONSL. ROCK (FT.)	WATER-BEARING MATERIAL	FORMATION	WATER LEVEL (FT.)	WATER LEVEL DATE MEAS.	YIELD (GPM)	YIELD (METHOD DETER-MINED)	LOG AVAIL-ABLE	QW TYPE	REMARKS
10	LIMESTONE	ONONDAGA LS	15	--	50	3	--	--	--
10	LIMESTONE	ONONDAGA LS	10	--	50	3	--	--	--
17	LIMESTONE	ONONDAGA LS	12	--	--	--	--	--	--
14	CALCAREOUS SHALE	CAMILLUS SH	3	6-61	--	--	--	P	H_2S; IRON; TURBID
--	FINE GRAINED SAND	--	--	--	--	--	D	--	--
5	LIMESTONE	ONONDAGA LS	20	--	100	--	--	--	--
14	LIMESTONE	ONONDAGA LS	12	--	10	--	D	--	--
19	LIMESTONE	ONONDAGA LS	30	--	--	--	--	--	H_2S
--	SAND	--	--	--	--	--	D	--	--
63	LIMESTONE	ONONDAGA LS	57	--	6	--	D	--	--
19	LIMESTONE	ONONDAGA LS	14	4-66	--	--	--	--	--
19	LIMESTONE	ONONDAGA LS	15	--	--	--	--	--	--
--	SAND AND GRAVEL	--	16	--	--	--	--	--	--
30	SAND AND GRAVEL	--	20	--	--	--	--	C	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
84	LIMESTONE	ONONDAGA LS	--	--	3	--	D	--	--
30	SAND AND GRAVEL	--	8	--	10	3	D	--	ALSO TAPS ONONDAGA LS
30	SHALE	CAMILLUS SH	--	--	5	3	--	--	--
20	SHALE	CAMILLUS SH	--	--	--	--	--	P	--
33	SHALE	CAMILLUS SH	20	4-66	8	3	--	--	--
--	SAND AND GRAVEL	--	34	--	2	--	D	--	--
35	LIMESTONE	ONONDAGA LS	15	--	20	--	D	--	--
31	SHALY DOLOMITE	SILURIAN CARBONATE RK	--	--	--	--	D	--	--
12	LIMESTONE	ONONDAGA LS	12	--	150	--	--	C	--
5	SHALY LIMESTONE	SILURIAN CARBONATE RK	F	--	30	--	D	P	H_2S
21	SHALE	CAMILLUS SH	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	20	-49	20	--	D	--	--
61	SHALE	CAMILLUS SH	7	--	11	3	D	P	"MINERAL" TASTE REPORTED
--	SAND AND GRAVEL	--	8	--	10	3	--	P	--
27	SHALE	CAMILLUS SH	--	--	--	--	D	--	--
135	SHALE	CAMILLUS SH	--	--	3	3	D	--	GAS; SALT WATER
--	SAND AND GRAVEL	--	10	-49	20	--	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	--	--	--
24	SAND	--	--	--	75	--	D	P	--
25	SAND AND GRAVEL	--	7	--	300	--	--	P	--
16	LIMESTONE	SILURIAN CARBONATE RK	12	--	5	3	D	--	--
--	SAND AND GRAVEL	--	8	8-66	--	--	--	--	--
25	SHALE	CAMILLUS SH	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	13	8-66	--	--	--	P	--
48	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	10	8-66	--	--	--	--	--
--	SAND AND GRAVEL	--	78	11-63	6	--	D	C	--
19	SHALY DOLOMITE	SILURIAN CARBONATE RK	1	6-52	--	--	D	--	--
13	SAND AND GRAVEL	--	--	--	--	--	D	--	--
8	SHALY DOLOMITE	SILURIAN CARBONATE RK	--	--	--	--	D	--	--
--	TILL	--	6	9-66	--	--	--	--	--
7	SHALY DOLOMITE	SILURIAN CARBONATE RK	--	--	--	--	D	--	--
34	SHALY LIMESTONE	SILURIAN CARBONATE RK	--	--	--	--	--	P	--
21	SHALE	CAMILLUS SH	--	--	--	--	D	--	--
38	SHALY LIMESTONE	SILURIAN CARBONATE RK	13	9-63	8	--	D	P	--
25	SHALY LIMESTONE	SILURIAN CARBONATE RK	13	--	128	--	D	P	SPEC. CAPACITY 13 GPM/FT
28	CALCAREOUS SHALE	SILURIAN CARBONATE RK	--	--	--	--	D	--	--
13	CALCAREOUS SHALE	SILURIAN CARBONATE RK	3	4-52	--	--	D	--	--
27	SHALY LIMESTONE	SILURIAN CARBONATE RK	40	--	20	--	D	P	SPEC. CAPACITY 0.3 GPM/FT
27	SAND AND GRAVEL	--	0	--	36	--	--	--	SPEC. CAPACITY 2.3 GPM/FT
--	SAND	--	15	--	20	--	D	--	--
20	CALCAREOUS SHALE	SILURIAN CARBONATE RK	--	--	--	--	D	--	--
7	CALCAREOUS SHALE	SILURIAN CARBONATE RK	14	--	3	--	D	--	--
16	CALCAREOUS SHALE	SILURIAN CARBONATE RK	--	--	--	--	D	--	--
10	CALCAREOUS SHALE	SILURIAN CARBONATE RK	4	--	--	--	D	--	--
--	SAND AND GRAVEL	--	7	--	60	--	--	--	IRON
28	SHALY DOLOMITE	SILURIAN CARBONATE RK	15	--	4	--	D	--	H_2S
10	CALCAREOUS SHALE	SILURIAN CARBONATE RK	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	1	-65	--	--	--	P	--
23	SAND AND GRAVEL	--	F	12-61	25	--	D	--	--
27	SHALE	CAMILLUS SH	30	--	10	--	D	--	--
10	SHALE	CAMILLUS SH	+11	4-64	30	--	D	P	H_2S; SPEC. CAPACITY 0.25 GPM/FT
11	SHALY LIMESTONE	SILURIAN CARBONATE RK	--	--	--	--	D	--	--
--	SHALY DOLOMITE	SILURIAN CARBONATE RK	--	--	--	--	--	--	--
8	SAND AND GRAVEL	--	4	2-52	--	--	D	--	--
40	SHALY DOLOMITE	SILURIAN CARBONATE RK	--	--	--	--	--	--	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
40	SHALY DOLOMITE	SILURIAN CARBONATE RK	--	--	--	--	--	--	--
16	SHALY LIMESTONE	SILURIAN CARBONATE RK	--	--	--	--	D	--	--
11	CALCAREOUS SHALE	CAMILLUS SH	12	8-66	20	3	--	C	--
38	SHALE	CAMILLUS SH	30	12-62	7	3	D	C	H_2S
10	SILTY SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	8	--	5	3	--	--	SALTY
--	TILL	--	9	9-60	--	--	--	L	--
27	CALCAREOUS SHALE	CAMILLUS SH	15	--	10	--	D	--	--
54	LIMESTONE	SILURIAN CARBONATE RK	37	-49	5	--	D	--	--

Table 5.--Records of selected wells and test holes in the Western Oswego River basin (Continued)

WELL NUMBER AND LOCATION	OWNER OR NAME	METHOD DRILLED	DATE DRILLED (YEAR)	WELL USE	WATER USE	WELL DEPTH (FT.)	CASING DEPTH (FT.)	CASING DIAM-ETER (IN.)	WELL FINISH	ALTI-TUDE-OF LSD (FT.)
425925N0771228.1	S LYONS	C	--	W	H	50	30	6	X	600
425926N0771225.1	S LYONS	D	--	W	H	24	23	18	W	610
425933N0772623.1	R OBEIRNE	C	1956	W	H	73	47	6	X	570
425935N0771936.1	NYS THRUWAY AUT	W	1951	T	U	24	--	4	X	590
425940N0765534.1	H MIERKE	D	1880	W	H	23	--	36	W	430
425940N0772043.1	NYS THRUWAY AUT	W	1951	T	U	23	--	4	X	580
425941N0772559.1	VICTOR N Y	H	1962	T	U	47	37	2	P	580
425941N0772600.1	VICTOR NY	C	1962	T	U	75	--	12	O	570
425942N0770829.1	A REED	C	1928	W	H	65	65	6	X	590
425943N0771637.1	E VAN CASTLE	C	1937	U	U	200	11	10	X	600
425944N0772204.1	NYS THRUWAY AUT	--	1946	T	U	43	--	4	X	600
425945N0770323.1	W VANDERMILL	C	1948	W	S	50	42	6	X	560
425946N0772226.1	NYS THRUWAY AUT	--	1946	T	U	45	--	4	--	540
425947N0772251.1	NYS THRUWAY AUT	--	1946	T	U	37	--	4	--	570
425956N0772459.1	NYS THRUWAY AUT	C	1953	T	U	56	--	6	S	700
425956N0772459.2	NYS THRUWAY AUT	C	1953	T	U	200	119	6	X	700
425959N0764544.1	L PROSSER	D	1943	W	S	23	--	18	W	380
425959N0765706.1	K BUISCH	D	--	U	U	14	--	36	W	410
430000N0770455.1	J AND PERKINS	C	1964	W	H	51	37	6	X	575
430002N0772027.1	J BLYER	C	1965	W	H	102	27	6	X	580
430003N0771237.1	H SPRAGUE	C	1951	W	H	70	--	6	X	575
430007N0771201.1	F GILFUS	A	1956	W	H	65	55	6	X	600
430016N0765352.1	P LUNDY	D	--	W	H	26	26	36	W	475
430019N0770447.1	E RIDLEY	C	1964	W	H	42	41	6	X	575
430021N0771928.1	K THOMPSON	C	1960	W	H	23	23	6	O	600
430021N0772559.1	NYS THRUWAY AUT	C	1953	T	U	200	105	6	X	700
430023N0771812.1	F SHELDON	C	1947	W	H	48	48	6	X	605
430040N0772214.1	J SHOEMAKER	C	1965	W	H	40	40	6	O	550
430051N0765950.1	S MCCOON	C	1966	W	H	59	53	6	X	500
430051N0772754.1	NYS THRUWAY AUT	W	1946	T	U	40	--	3	X	500
430051N0772758.1	NYS THRUWAY AUT	W	1946	T	U	70	--	4	X	485
430051N0772811.1	NYS THRUWAY AUT	W	1946	T	U	97	--	4	X	505
430052N0764211.1	H BARTON	C	1954	U	U	116	--	6	X	390
430052N0771902.1	J HOLTZ	C	--	W	H	80	41	6	X	610
430052N0772819.1	NYS THRUWAY AUT	W	1946	T	U	51	--	4	X	520
430057N0764213.1	E THURSTON	D	--	W	H	17	--	36	W	400
430103N0765909.1	UNKNOWN	D	--	U	U	10	--	30	W	410
430105N0765245.1	D HANCH	C	1935	W	H	42	32	6	X	510
430111N0765935.1	L LAUSTER	C	1961	W	H	43	19	6	X	470
430112N0763940.1	W LOVELAND	D	--	U	U	46	--	48	W	460
430112N0764003.1	L OHARA	C	1954	W	H	97	80	6	X	440
430112N0771611.1	L GREEN	C	1930	W	H	71	71	6	O	580
430114N0770150.1	C SLOCUM	C	1961	W	H	15	10	6	S	535
430115N0764753.1	USGS	B	1966	T	U	93	--	6	X	380
430117N0764631.1	J WOOD	C	1958	W	H	65	56	6	X	460
430119N0770328.1	D LAWRENCE	C	1963	W	H	30	28	6	X	510
430123N0770308.1	G VAN CAMP	C	--	W	S	51	13	6	X	550
430125N0764451.1	DIMON AND SONS	C	1952	W	C	70	65	8	G	400
430127N0764444.1	A RECCKIO	C	1957	W	H	69	71	6	O	390
430127N0764937.1	G TWEEDY	D	1900	W	H	26	--	18	W	450
430127N0771255.1	A THOMPSON	C	1961	W	H	35	35	6	O	555
430128N0771150.1	M DEMAY	C	--	W	S	50	37	6	X	550
430129N0765849.1	J B FARMAN	C	1941	W	H	65	20	5	X	460
430131N0764705.1	LOPEZ BROS	C	--	W	H	120	100	6	X	390
430131N0771414.1	I VERHUELLE	C	1944	W	H	50	45	6	S	550
430134N0763839.1	W MAPLEY	D	--	W	S	24	--	24	W	500
430136N0772114.1	R WEIGERT	C	1945	W	H	108	100	6	X	580
430139N0765709.1	USGS	B	1966	T	U	103	--	6	X	390
430143N0770805.1	A LANNON	C	1961	W	H	25	25	6	O	520
430149N0771957.1	R WILKINSON	C	1954	W	H	60	56	6	X	560
430150N0765727.1	BRONHEIMER	C	1963	W	H	54	50	6	X	450
430151N0772004.1	G KATAMIER	C	1957	W	H	40	33	6	X	560
430151N0772006.1	F KATAMIER	C	1930	W	H	40	38	6	X	560
430153N0764638.1	L BENNETT	C	1966	W	H	42	36	6	X	470
430154N0772103.1	H ALLEN	C	1946	W	H	90	70	6	X	550
430156N0771706.1	R JOSLYN	D	1964	W	H	9	--	36	W	530
430158N0764639.1	K COLEGRAVE	C	1966	W	H	30	30	6	O	480
430202N0765703.1	SPIES BROS	C	1964	W	H	48	46	6	X	450
430204N0771341.1	W FINNERTY	C	1948	W	H	175	90	6	X	550
430212N0771643.1	D CORNETTE	C	1962	W	H	85	--	6	X	570
430225N0770806.1	C TELLIER	C	1965	W	H	168	97	6	X	465
430227N0764507.1	B DIMON	C	1955	W	H	164	164	6	O	480
430230N0770517.1	PERFECTION FOOD	C	1951	T	U	42	--	8	X	450
430232N0770514.1	PERFECTION FOOD	C	1951	T	U	140	135	6	X	450
430233N0770516.1	PERFECTION FOOD	C	1951	T	U	60	46	8	X	450
430238N0770817.1	F BLONDELL	C	1957	W	--	134	--	6	X	500
430243N0765155.1	C CONEY	C	1961	W	H	111	50	6	X	420
430244N0765154.1	C CONEY	C	1947	U	U	125	55	6	X	430
430244N0765514.1	USGS	B	1966	T	U	93	--	6	X	390
430244N0771213.1	I VAN BORDEL	C	--	W	H	125	85	6	X	560
430252N0770451.1	NYSDPW	--	1966	T	U	25	--	--	X	390

DEPTH TO CONSL. ROCK (FT.)	WATER-BEARING MATERIAL	FORMATION	WATER LEVEL (FT.)	WATER LEVEL DATE MEAS.	YIELD (GPM)	YIELD (METHOD DETER-MINED)	LOG AVAIL-ABLE	QW TYPE	REMARKS
30	SHALY DOLOMITE	SILURIAN CARBONATE RK	42	--	--	--	--	P	--
--	SAND AND GRAVEL	--	8	8-66	--	--	--	P	--
45	SHALY LIMESTONE	SILURIAN CARBONATE RK	+6	--	50	--	--	--	H_2S
11	SHALY LIMESTONE	SILURIAN CARBONATE RK	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	13	8-66	5	--	--	P	--
3	SHALY LIMESTONE	SILURIAN CARBONATE RK	4	12-46	--	--	D	--	--
74	SAND AND GRAVEL	--	F	6-66	25	--	D	P	IRON; SPEC. CAPACITY 2.0 GPM/FT
74	SAND AND GRAVEL	--	+6	1-62	35	--	D	--	SPEC. CAPACITY 2.5 GPM/FT
--	SAND AND GRAVEL	--	31	11-47	16	--	--	--	--
10	SHALE	CAMILLUS SH	4	--	13	--	D	--	--
25	CALCAREOUS SHALE	CAMILLUS SH	--	--	--	--	D	--	--
42	CALCAREOUS SHALE	CAMILLUS SH	25	--	5	--	D	--	--
17	FINE GRAINED SAND	--	2	3-46	--	--	D	--	--
--	VERY FINE GRAINED SAND	--	5	3-46	--	--	D	--	--
112	SAND AND GRAVEL	--	16	--	25	--	D	P	SPEC. CAPACITY 0.7 GPM/FT
112	CALCAREOUS SHALE	CAMILLUS SH	110	--	9	--	--	--	SPEC. CAPACITY 0.19 GPM/FT
--	SAND AND GRAVEL	--	11	--	--	--	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	--	--	--
36	SHALE	CAMILLUS SH	38	9-64	20	3	D	C	--
26	SHALY DOLOMITE	SILURIAN CARBONATE RK	5	--	--	--	--	--	--
15	SHALY DOLOMITE	SILURIAN CARBONATE RK	12	--	20	3	D	C	--
55	CALCAREOUS SHALE	CAMILLUS SH	35	--	5	--	--	P	--
--	SAND AND GRAVEL	--	17	8-66	--	--	--	P	--
32	SHALE	CAMILLUS SH	17	9-64	5	3	D	--	--
--	SAND AND GRAVEL	--	--	--	--	--	--	P	--
105	SHALY LIMESTONE	CAMILLUS SH	72	--	13	--	D	--	SPEC. CAPACITY 0.12 GPM/FT
46	SHALE	CAMILLUS SH	33	-47	10	--	--	--	--
40	SHALY DOLOMITE	SILURIAN CARBONATE RK	32	4-65	15	--	--	C	H_2S
50	SHALE	CAMILLUS SH	20	8-66	7	3	D	P	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	14	9-46	--	--	D	--	--
--	SAND	--	--	--	--	--	D	--	--
--	SHALE	CAMILLUS SH	2	9-59	--	--	--	J	IRON
40	SHALE	CAMILLUS SH	50	--	1	--	--	--	--
--	SAND	--	--	--	--	--	D	--	--
--	TILL	--	9	9-59	--	--	--	J	--
--	SAND AND GRAVEL	--	6	4-66	--	--	--	P	--
32	SHALE	CAMILLUS SH	8	--	20	--	D	--	--
19	SHALE	CAMILLUS SH	15	11-61	15	3	D	P	--
--	TILL	--	17	9-59	--	--	--	J	--
60	SHALE	CAMILLUS SH	50	--	15	3	--	J	IRON; "MINERAL" TASTE REPORTED
--	CALCAREOUS SHALE	CAMILLUS SH	28	7-66	--	--	--	P	--
--	SAND AND GRAVEL	--	4	--	13	3	--	C	--
--	SAND AND GRAVEL	--	--	--	--	--	G	--	SALT WATER
43	SHALE	CAMILLUS SH	19	8-58	25	3	--	P	--
22	CALCAREOUS SHALE	CAMILLUS SH	15	5-63	20	3	D	--	--
12	SHALE	CAMILLUS SH	44	--	--	--	D	--	--
--	SAND AND GRAVEL	--	15	--	100	3	--	L	IRON
65	SHALE	CAMILLUS SH	9	9-60	35	3	D	L	IRON
--	SAND AND GRAVEL	--	21	8-66	--	--	--	--	--
35	SAND AND GRAVEL	--	15	12-61	5	3	--	P	--
36	SHALE	CAMILLUS SH	20	--	18	--	--	--	--
20	SHALE	CAMILLUS SH	37	-41	--	--	--	P	--
100	SHALE	CAMILLUS SH	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	4	9-44	--	--	D	--	--
--	TILL	--	19	9-59	--	--	--	J	MAY GO DRY IN SUMMER
90	SHALE	CAMILLUS SH	40	9-45	--	--	--	--	--
--	SAND AND GRAVEL	--	--	--	--	--	G	--	--
--	SAND AND GRAVEL	--	--	--	6	3	--	P	--
55	SHALE	CAMILLUS SH	10	--	40	3	D	C	--
3	SHALE	CAMILLUS SH	17	9-63	--	--	--	--	--
33	SHALE	CAMILLUS SH	15	--	8	3	D	--	--
38	SHALE	CAMILLUS SH	--	--	--	--	--	--	--
36	SHALE	CAMILLUS SH	--	--	7	3	--	P	--
70	SHALE	CAMILLUS SH	35	-66	15	--	--	--	--
--	SAND AND GRAVEL	--	5	8-66	--	--	--	C	--
30	SAND	--	13	7-66	22	3	--	--	SAND IN WATER
24	SHALE	CAMILLUS SH	10	3-64	7	3	D	--	--
84	SHALE	CAMILLUS SH	30	9-48	2	--	D	P	--
--	CALCAREOUS SHALE	CAMILLUS SH	--	--	--	--	--	P	TURBID
50	SHALE	CAMILLUS SH	28	4-65	50	3	D	P	--
--	SAND AND GRAVEL	--	79	9-60	5	3	--	--	--
--	SAND AND GRAVEL	--	15	6-51	--	--	D	--	--
--	SAND AND GRAVEL	--	F	--	--	--	D	--	SALT WATER
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
30	SHALE	CAMILLUS SH	8	--	--	--	--	P	SALT WATER
50	CALCAREOUS SHALE	CAMILLUS SH	32	--	4	--	--	P	--
55	CALCAREOUS SHALE	CAMILLUS SH	31	8-66	5	--	D	--	--
--	VERY FINE GRAINED SAND	--	--	--	--	--	G	--	--
85	SHALE	CAMILLUS SH	60	--	20	--	D	--	--
6	SHALE	CAMILLUS SH	3	--	--	--	D	--	--

Table 5.--Records of selected wells and test holes in the Western Oswego River basin (Continued)

WELL NUMBER AND LOCATION	OWNER OR NAME	METHOD DRILLED	DATE DRILLED (YEAR)	WELL USE	WATER USE	WELL DEPTH (FT.)	CASING DEPTH (FT.)	CASING DIAM-ETER (IN.)	WELL FINISH	ALTI-TUDE OF LSD (FT.)
430256N0770527.1	RIEGLE PAPER CO	C	1945	W	N	48	28	--	G	440
430258N0770749.1	K LARSON	C	--	W	C	75	75	6	X	500
430259N0771016.1	J JOHNSON	C	1965	W	H	53	51	7	X	480
430301N0771016.1	J JOHNSON	C	1964	W	H	75	73	6	X	480
430301N0771931.1	MACEDON NY	H	1960	T	U	56	--	2	S	470
430301N0771937.1	MACEDON NY	H	1960	T	U	56	37	2	S	470
430306N0771017.1	R MAHONEY	C	1964	W	H	46	41	6	X	470
430307N0770532.1	PENN RAILROAD	C	--	W	N	33	33	8	--	430
430311N0765635.1	E CARPENTER	C	1964	W	H	30	--	6	O	435
430321N0770750.1	J MONJE	C	1964	W	H	23	23	6	X	425
430323N0764345.1	USGS	B	1966	T	U	93	--	6	X	380
430324N0770737.1	A OLSEN	C	1966	W	H	46	46	6	O	500
430325N0771906.1	MACEDON NY	H	1960	T	U	43	--	6	X	470
430327N0770343.1	O ADSITT	C	--	W	C	30	28	6	X	435
430327N0770348.1	O ADSITT	C	--	W	H	30	30	6	O	440
430329N0770339.1	O ADSITT	C	1960	W	H	32	32	6	O	430
430335N0765101.1	NY WATER SER CO	C	1954	T	U	25	--	12	--	400
430335N0770059.1	O ROCKWELL	C	1965	U	U	17	13	6	X	390
430335N0770414.1	L DEBARR	C	1962	W	H	126	121	6	X	510
430335N0770559.1	NEWARK NY	C	1943	W	P	38	--	--	S	440
430336N0765050.1	NY WATER SER CO	C	1954	T	U	60	--	12	--	420
430336N0770054.1	J SCHNABEL	D	--	U	U	8	8	30	O	400
430337N0765857.1	NYSDPW	--	1961	T	U	72	--	--	--	390
430338N0770553.1	NEWARK NY	C	--	W	P	100	--	8	S	450
430342N0765119.1	NY WATER SER CO	R	1954	T	U	13	--	6	X	400
430343N0763804.1	NYSDPW	B	--	T	U	37	20	--	X	390
430343N0771553.1	MACEDON NY	H	1964	T	U	45	--	6	X	450
430344N0763806.1	A WILSON	--	--	U	U	30	30	6	O	390
430344N0770119.1	J LYTLE	D	1960	W	I	12	--	36	X	400
430344N0770418.1	G DEBARR	C	1964	W	H	130	90	6	X	525
430344N0771540.1	MACEDON NY	H	1964	T	U	15	--	6	X	440
430347N0771119.1	E TROWBRIDGE	C	1965	W	H	30	--	6	X	460
430347N0771547.1	MACEDON NY	C	1964	T	U	36	--	12	S	450
430348N0771544.1	MACEDON N Y	H	1964	T	U	24	--	6	X	450
430348N0771841.1	MACEDON NY	H	1960	T	U	46	--	6	X	470
430349N0765854.1	LYONS NY	C	1949	W	Z	393	210	6	X	395
430349N0765858.1	LYONS N Y	C	1962	W	P	62	57	10	G	395
430350N0765858.1	LYONS NY	C	1949	U	P	61	61	8	P	359
430350N0770520.1	KERR MCGEE CHEM	A	1958	W	N	85	29	8	P	420
430350N0770520.2	K MCGEE CHEM CO	C	1938	Z	U	54	30	6	X	420
430352N0765857.1	LYONS NY	C	1944	W	P	67	--	8	P	395
430352N0765928.1	UNKNOWN	C	1948	W	N	62	25	8	S	420
430353N0770234.1	USGS	B	1966	T	U	13	--	6	X	415
430354N0771101.1	NYSDPW	C	1965	W	H	30	--	6	X	440
430354N0771520.1	R GILBERT	C	1964	W	H	32	32	6	O	505
430400N0765001.1	R SHARP	D	--	W	H	17	--	15	--	400
430403N0770529.1	NYSDPW	--	1965	T	U	23	--	--	--	410
430405N0771903.1	MACEDON NY	D	--	W	P	20	--	120	W	480
430406N0770248.1	A BRODLEY	V	1965	W	H	14	14	2	T	425
430407N0770653.1	USGS	B	1966	T	U	75	--	6	X	410
430407N0771910.1	MACEDON NY	H	1960	T	U	16	--	6	X	480
430408N0770716.1	P DEMAY	C	--	W	H	52	52	6	O	440
430409N0771055.1	R HALSEY	D	1965	W	H	23	--	12	C	440
430409N0771103.1	USGS	B	1966	T	U	9	--	6	X	415
430411N0771134.1	L BREED	C	1960	W	H	102	102	6	O	490
430411N0771926.1	MACEDON NY	C	1956	W	P	32	27	12	G	480
430412N0771038.1	R KOESTER	C	1961	U	U	49	38	6	X	450
430413N0770140.1	G LEISENRING	C	1963	W	H	42	41	6	X	425
430414N0771923.1	MACEDON NY	H	1960	T	U	41	19	2	S	490
430414N0771928.1	MACEDON NY	C	1956	W	P	26	21	12	G	480
430414N0771946.1	MACEDON NY	H	1960	T	U	18	--	6	X	540
430415N0765649.1	M SONTHEIN	C	1947	W	H	95	85	6	X	455
430416N0771745.1	MOBIL CHEMICAL	C	1956	W	N	260	40	12	X	450
430418N0770651.1	UNKNOWN	C	--	W	H	105	63	6	X	440
430418N0771540.1	PALMYRA SCHOOL	C	1965	W	T	60	52	6	X	470
430421N0764654.1	USGS	B	1966	T	U	88	--	6	X	385
430421N0770210.1	C BARTISHEVICH	D	--	W	H	18	--	36	W	450
430426N0770926.1	H HERMAN	C	1965	W	H	30	17	6	X	465
430434N0763852.1	D HOWDEN	C	1960	Z	U	94	94	6	O	380
430434N0770640.1	H WELCHER	C	--	W	H	185	124	6	X	460
430434N0772145.1	STEFFEN AND SON	C	1945	U	U	120	51	6	X	465
430435N0770626.1	C ARBOGAST	C	1964	W	H	96	88	6	X	430
430437N0770034.1	A STOOP	D	--	W	H	35	--	40	W	420
430441N0764215.1	USGS	B	1966	T	U	57	--	6	X	370
430441N0770239.1	M GANSZ	D	--	S	H	14	--	24	W	435
430442N0764053.1	NYS CONS DEPT	D	--	U	U	20	--	36	W	425
430445N0764059.1	NYS CONS DEPT	C	1949	W	H	153	153	8	O	445
430447N0765555.1	D COLE	C	--	W	H	32	32	6	O	395
430447N0765614.1	R SPROSS	C	1956	W	C	55	55	6	O	400
430452N0770642.1	R HURLING	C	1965	W	H	135	120	6	X	490

DEPTH TO CONSL. ROCK (FT.)	WATER-BEARING MATERIAL	FORMATION	WATER LEVEL (FT.)	WATER LEVEL DATE MEAS.	YIELD (GPM)	YIELD (METHOD DETER-MINED)	LOG AVAIL-ABLE	QW TYPE	REMARKS
--	SAND AND GRAVEL	--	14	9-45	1000	--	D	P	PUMPAGE ABOUT 1 MGD
0	SHALE	CAMILLUS SH	4	4-66	--	--	--	--	--
50	SHALE	CAMILLUS SH	12	9-65	6	3	D	--	--
50	SHALE	CAMILLUS SH	29	--	7	3	--	P	--
54	SAND AND GRAVEL	--	--	--	50	--	D	P	SPEC. CAPACITY 7 GPM/FT
54	SAND AND GRAVEL	--	--	--	--	--	D	--	--
5	SHALE	CAMILLUS SH	17	7-65	10	3	--	--	--
--	SAND AND GRAVEL	--	8	--	400	--	--	C	--
--	SAND AND GRAVEL	--	22	9-64	2	3	D	--	--
--	SAND AND GRAVEL	--	9	--	50	3	D	--	--
--	VERY FINE GRAINED SAND	--	--	--	--	--	G	--	--
--	COARSE GRAINED SAND	--	28	--	25	3	D	--	--
40	SHALE	CAMILLUS SH	--	--	--	--	D	--	--
28	SHALE	CAMILLUS SH	--	--	7	3	--	P	--
--	SAND AND GRAVEL	--	--	--	60	--	--	--	--
--	SAND AND GRAVEL	--	17	--	20	3	D	--	--
24	SAND AND GRAVEL	--	--	--	--	--	D	--	--
10	SHALE	CAMILLUS SH	5	6-65	50	3	D	--	--
120	SHALE	CAMILLUS SH	70	--	5	3	D	--	--
--	SAND AND GRAVEL	--	28	8-66	300	--	D	--	--
59	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SILTY SAND	--	1	4-66	--	--	--	P	--
--	SAND AND GRAVEL	--	13	3-61	--	--	D	--	--
--	SAND AND GRAVEL	--	27	9-66	100	--	D	--	--
--	SHALE	CAMILLUS SH	--	--	--	--	--	--	--
33	SILTY SAND	--	--	--	--	--	D	--	--
40	SHALE	CAMILLUS SH	--	--	--	--	D	--	--
33	SILTY SAND AND GRAVEL	--	6	6-61	--	--	--	L	SALTY
8	SHALE	CAMILLUS SH	5	--	--	--	--	P	INADEQUATE
90	SHALE	CAMILLUS SH	30	6-64	7	3	D	C	--
--	TILL	--	--	--	--	--	--	--	--
6	SHALE	CAMILLUS SH	F	--	5	3	--	--	--
--	SAND AND GRAVEL	--	17	12-64	337	--	--	--	--
--	SAND AND GRAVEL	--	--	--	--	--	--	--	--
38	SHALE	CAMILLUS SH	--	--	--	--	D	--	--
60	SHALE	CAMILLUS SH	0	2-50	86	--	D	P	SALT WATER
62	SAND AND GRAVEL	--	14	3-65	1000	--	D	C	SPEC. CAPACITY 55 GPM/FT
65	SAND AND GRAVEL	--	7	2-50	500	--	D	P	--
30	SHALE	CAMILLUS SH	14	--	40	--	--	--	--
26	SHALE	CAMILLUS SH	4	--	250	--	--	--	--
65	SAND AND GRAVEL	--	--	--	600	--	D	P	SPEC. CAPACITY 26 GPM/FT
62	SAND AND GRAVEL	--	18	--	100	--	D	--	--
9	SHALE	CAMILLUS SH	3	10-66	--	--	G	--	--
--	SHALE	CAMILLUS SH	--	--	5	3	--	P	--
30	SHALE	CAMILLUS SH	11	--	5	3	--	P	--
--	GRAVELLY TILL	--	13	--	--	--	--	P	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	6	6-65	175	--	--	--	--
--	SAND AND GRAVEL	--	--	--	5	--	--	--	--
73	SAND AND GRAVEL	--	--	--	--	--	G	--	--
--	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	--	--	20	--	D	--	--
18	SHALE	CAMILLUS SH	14	8-65	5	--	--	--	--
8	FINE GRAINED SAND	--	--	--	--	--	--	--	--
--	SAND AND GRAVEL	--	44	9-60	5	3	D	P	--
--	COARSE GRAINED SAND	--	3	7-56	260	--	D	--	SPEC. CAPACITY 21 GPM/FT
35	SHALE	CAMILLUS SH	27	5-66	80	3	D	--	--
40	SHALE	CAMILLUS SH	21	9-63	40	3	D	P	--
--	SAND AND GRAVEL	--	1	6-66	50	--	D	P	--
--	SAND AND GRAVEL	--	2	7-56	275	--	D	--	--
--	TILL	--	--	--	--	--	D	--	--
85	SHALE	CAMILLUS SH	45	--	7	--	D	--	--
20	SHALE	CAMILLUS SH	25	10-56	1000	--	--	C	--
63	SHALE	CAMILLUS SH	33	--	30	--	D	--	IRON
50	SHALE	CAMILLUS SH	6	5-65	2	3	D	--	--
86	FINE GRAINED SAND	--	--	--	--	--	G	--	--
--	SAND AND GRAVEL	--	--	--	--	--	--	--	--
17	SHALE	CAMILLUS SH	18	4-65	5	3	D	--	--
94	SAND AND GRAVEL	--	15	6-60	80	3	D	--	SALTY
124	SHALE	VERNON SH	28	--	12	--	D	--	--
51	SHALE	VERNON SH	F	--	400	--	--	P	H_2S
50	SHALE	VERNON SH	17	10-64	8	3	D	C	--
--	SAND AND GRAVEL	--	15	--	--	--	--	--	--
--	FINE GRAINED SAND	--	--	--	--	--	G	--	--
--	SAND AND GRAVEL	--	0	--	--	--	--	--	--
--	TILL	--	8	6-61	--	--	--	L	--
--	SAND AND GRAVEL (?)	--	140	--	15	3	--	L	--
--	SAND	--	2	4-66	--	--	--	--	--
--	SAND AND GRAVEL	--	--	--	--	--	--	--	--
120	SHALE	VERNON SH	37	5-66	25	3	D	--	--

Table 5.--Records of selected wells and test holes in the Western Oswego River basin (Continued)

WELL NUMBER AND LOCATION	OWNER OR NAME	METHOD DRILLED	DATE DRILLED (YEAR)	WELL USE	WATER USE	WELL DEPTH (FT.)	CASING DEPTH (FT.)	CASING DIAM-ETER (IN.)	WELL FINISH	ALTI-TUDE OF LSD (FT.)
430452N0770728.1	B HERMUNET	C	1964	W	H	90	87	7	X	445
430454N0765220.1	NYSDPW	—	1966	T	U	60	--	--	—	390
430456N0763843.1	L ROARKE	D	--	W	H	27	--	42	W	390
430458N0765216.1	P DELEO	C	1965	W	C	40	29	7	X	400
430501N0765510.1	G ATKINS	D	1940	W	S	22	22	40	W	400
430501N0770745.1	C TYLER	C	1964	W	H	36	34	6	X	425
430505N0765440.1	R CARPINO	D	--	W	H	15	15	40	W	440
430509N0770813.1	USGS	B	1966	T	U	25	0	6	X	415
430510N0765525.1	J BOWEN	C	1965	W	H	105	95	6	X	405
430512N0770727.1	P HENKEL	C	--	W	S	73	73	6	O	470
430514N0765326.1	NY WATER SER	D	--	W	P	22	--	216	W	390
430515N0770357.1	P BEMAN	D	--	W	H	15	15	18	W	555
430519N0770733.1	A ALLEN	C	1965	W	H	108	102	7	X	490
430520N0765528.1	H CURR	C	1964	W	H	137	100	6	X	425
430520N0770149.1	N BRANDT	C	1963	W	H	70	51	7	X	440
430523N0765339.1	P CAPRILLA	C	1964	W	C	24	18	6	S	390
430525N0765357.1	E MOTORS	C	--	W	C	86	86	7	O	390
430527N0764534.1	SAVANNAH NY	D	1946	W	P	17	12	144	C	390
430530N0771640.1	MACEDON NY	H	1964	T	U	14	--	6	X	450
430532N0771645.1	MACEDON NY	H	1964	T	U	12	--	6	X	450
430546N0763851.1	E SHERMAN	D	--	W	H	7	--	36	W	410
430549N0772106.1	G AMESBURY	C	--	W	H	59	50	6	X	—
430550N0765412.1	DAPAHITO BROS	C	1965	W	H	35	33	7	X	395
430550N0770344.1	USGS	B	1966	T	U	27	0	6	X	410
430552N0765531.1	F KULOW	C	1952	W	H	115	111	7	X	430
430552N0770314.1	K HARDIN	C	1960	W	H	54	54	6	O	450
430557N0770740.1	P HENKEL	C	1965	W	H	84	84	6	O	580
430601N0765540.1	G MOON	C	1945	W	H	156	--	6	X	440
430605N0765124.1	F BURT	C	1946	W	H	105	91	6	X	460
430607N0764540.1	B WATERMAN	D	--	W	H	29	--	36	W	420
430608N0765431.1	M OSBORNE	D	1920	U	U	23	--	40	W	400
430609N0764941.1	A BORAV	C	1927	W	S	127	65	6	X	445
430614N0765251.1	L PUPLE	C	1965	W	H	89	88	7	X	400
430614N0772106.1	D DUKES	C	1964	W	H	93	93	6	O	545
430616N0765027.1	J THOMS	C	1950	W	H	51	--	6	--	470
430620N0764822.1	A PITZERUSE	D	1880	W	H	34	--	60	W	420
430625N0765909.1	NYSDPW	--	1966	T	U	22	--	--	--	440
430628N0765550.1	C FELLOWS	D	--	W	H	28	--	40	W	410
430631N0763853.1	C ROBERTS	C	1954	W	H	65	65	6	O	440
430634N0763851.1	C ROBERTS	C	1944	W	H	203	69	6	X	440
430641N0764912.1	R RICE	D	--	U	U	30	--	36	W	460
430642N0770355.1	W BRIGHTMAN	C	1966	W	H	23	23	6	O	435
430643N0770530.1	W LEO	C	1960	W	H	92	92	6	O	470
430645N0765247.1	S WIGFIELD	C	1958	W	H	101	74	6	X	400
430646N0765251.1	S WIGFIELD	D	--	W	H	28	--	40	W	400
430647N0770809.1	I FISHER	C	1965	W	H	58	57	6	X	495
430647N0770904.1	A HOPPE	C	1964	W	H	76	50	6	X	480
430649N0765558.1	P ROBENSON	C	1949	W	H	68	68	7	O	410
430650N0765525.1	C YOUNG	D	--	W	H	14	14	40	W	410
430652N0770439.1	O TYLER	C	1964	W	H	58	29	6	X	440
430655N0770634.1	R PRICE	C	1964	W	H	72	63	6	X	460
430656N0770446.1	S DEBLAERE	C	1964	W	U	26	22	6	X	430
430658N0770450.1	G ORBAKER	C	1965	W	U	41	21	8	X	425
430700N0770442.1	FAIRVILLE FD	C	1964	W	U	62	30	6	X	450
430701N0770443.1	C HOCKENBERGER	C	1964	W	C	62	50	6	X	445
430701N0770447.1	B PORTER	C	1964	W	C	47	42	6	X	440
430708N0765027.1	H FISHER	C	1962	W	H	92	92	6	O	450
430709N0770447.1	A WIENER	D	--	W	H	28	--	30	C	450
430710N0765643.1	P LIND	D	1962	W	H	44	--	40	W	405
430711N0765353.1	G BARNES	C	1962	W	S	154	126	7	X	460
430713N0771516.1	J PIRRELLO	--	1963	U	U	60	27	6	X	450
430715N0763853.1	CONQUEST TOWN	D	--	W	H	16	--	36	W	440
430718N0764534.1	R WARRICK	D	--	U	U	17	--	36	W	470
430720N0764834.1	C PARKER	C	1957	W	H	61	33	6	X	405
430721N0770047.1	F PACELLO	C	1963	W	H	100	75	6	X	500
430722N0764534.1	A VANVLECK	C	1950	W	H	107	107	6	O	460
430723N0771741.1	WALWORTH NY	H	1965	T	U	24	--	8	X	475
430725N0770326.1	P GLEINIUS	C	--	W	S	95	30	6	X	440
430727N0764127.1	L KNAPP	C	1959	W	H	86	86	6	O	410
430730N0771623.1	WALWORTH NY	C	1966	T	U	75	31	12	X	470
430736N0770645.1	P LARSE	C	1960	W	H	61	54	6	X	470
430738N0770621.1	A ADAMS	D	--	W	H	16	--	40	W	455
430746N0764735.1	H NOBLE	C	--	W	H	115	105	6	X	480
430746N0770351.1	I HEIDENREICH	C	1937	W	S	38	24	6	X	440
430747N0771538.1	WALWORTH NY	H	1965	T	U	10	--	8	X	450
430748N0764804.1	C FRANCIS	D	--	W	H	24	--	30	W	490
430750N0763855.1	J SHAFFER	C	--	W	H	52	--	6	--	430
430751N0770653.1	L DECKER	C	1960	W	H	97	90	6	X	500
430753N0770813.1	UNKNOWN	D	--	U	U	11	--	35	W	490

DEPTH TO CONSL. ROCK (FT.)	WATER-BEARING MATERIAL	FORMATION	WATER LEVEL (FT.)	WATER LEVEL DATE MEAS.	YIELD (GPM)	YIELD (METHOD DETER-MINED)	LOG AVAIL-ABLE	QW TYPE	REMARKS
87	SHALE	VERNON SH	32	8-65	10	3	D	P	--
29	SILTY SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	6	10-59	--	--	--	J	SALTY
25	SHALE	CAMILLUS SH	6	--	40	3	D	--	--
--	CLAYEY SILT	--	18	--	.4	--	--	--	--
32	SHALE	VERNON SH	8	7-64	50	3	D	C	--
--	SAND AND GRAVEL	--	--	--	--	--	--	C	--
24	FINE GRAINED SAND	--	--	--	--	--	G	--	--
50	SHALE	CAMILLUS SH	--	--	--	--	--	--	--
--	SAND AND GRAVEL	--	50	--	6	--	D	--	--
--	SAND AND GRAVEL	--	8	3-65	318	--	--	M	SPEC. CAPACITY 30 GPM/FT
--	SAND AND GRAVEL	--	5	--	--	--	--	--	--
100	SHALE	VERNON SH	78	8-65	2	3	--	P	--
100	SHALE	VERNON SH	--	--	--	--	--	P	--
38	SHALE	VERNON SH	30	11-63	3	3	D	--	--
--	SAND AND GRAVEL	--	5	6-65	175	3	D	P	--
--	SAND AND GRAVEL	--	--	-58	50	3	D	C	--
--	SAND AND GRAVEL	--	6	6-62	100	--	--	P	--
3	SHALE	VERNON SH	3	8-64	30	--	D	--	--
8	SHALE	VERNON SH	--	--	--	--	D	--	--
--	TILL	--	4	10-59	--	--	--	J	--
18	SHALE	VERNON SH	15	--	40	3	--	--	--
--	SANDY CLAY	--	6	3-65	2	3	D	--	--
24	SAND AND GRAVEL	--	--	--	--	--	G	--	--
105	SHALE	VERNON SH	45	-52	20	3	D	--	--
37	SHALE	VERNON SH	34	--	30	3	D	--	--
--	SAND	--	--	--	6	3	D	--	--
103	SHALE	VERNON SH	54	--	50	--	--	--	--
60	SHALE	VERNON SH	65	9-60	15	3	D	P	ANALYSIS SUPPLIED BY OWNER
--	TILL	--	22	9-60	--	--	--	L	--
--	SAND	--	7	5-66	--	--	--	--	--
65	SHALE	VERNON SH	--	--	5	3	--	L	H_2S
86	SHALE	VERNON SH	13	12-65	13	3	D	P	--
--	SHALE	VERNON SH	--	--	--	--	--	P	--
--	SAND AND GRAVEL	--	28	9-60	10	3	--	L	--
--	SAND AND GRAVEL	--	7	8-66	--	--	--	P	--
20	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SILTY SAND	--	--	--	--	--	--	--	--
70	SAND AND GRAVEL	--	22	10-59	--	--	--	J	H_2S
69	SAND AND GRAVEL	--	37	10-59	--	--	--	J	H_2S; UNPLEASANT TASTE
--	TILL	--	25	9-60	--	--	--	L	--
--	SAND AND GRAVEL	--	5	6-66	16	3	--	P	--
--	SHALE	VERNON SH	35	5-60	20	3	D	--	--
74	SHALE	VERNON SH	12	9-58	10	3	D	P	--
--	TILL	--	--	--	--	--	--	P	--
50	SHALE	VERNON SH	41	4-65	20	--	D	--	--
--	SHALE	VERNON SH	46	4-64	15	3	D	C	--
--	SAND AND GRAVEL	--	20	-49	1	3	D	--	--
--	SAND AND GRAVEL	--	12	6-66	--	--	--	P	--
20	SHALE	VERNON SH	10	10-64	6	3	D	P	--
52	SHALE	VERNON SH	20	6-64	11	3	D	--	--
18	SHALE	VERNON SH	F	5-64	100	3	D	P	--
10	SHALE	VERNON SH	+3	--	--	--	D	--	IRON
29	SHALE	VERNON SH	F	4-66	38	1	D	C	IRON
45	SHALE	VERNON SH	6	6-64	50	3	D	--	--
42	SHALE	VERNON SH	12	6-64	15	3	D	--	--
--	TILL	--	57	--	4	--	D	--	PROBABLY TAPS CSE. ZONE IN TILL
--	SILTY SAND	--	--	--	--	--	--	C	--
--	SAND AND GRAVEL	--	8	--	--	--	--	--	--
120	SHALE	VERNON SH	75	--	--	--	D	--	--
24	SHALE	VERNON SH	+13	6-66	100	--	D	P	H_2S
--	SAND AND GRAVEL	--	12	10-59	4	--	--	J	--
--	TILL	--	7	9-60	--	--	--	L	--
33	SHALE	VERNON SH	F	8-66	4	--	--	C	IRON
73	SHALE	VERNON SH	62	--	8	3	D	C	--
--	SHALE	VERNON SH	--	--	20	3	--	L	IRON
22	SHALE	VERNON SH	--	--	--	--	D	--	--
30	SHALE	VERNON SH	11	--	20	--	D	--	IRON
--	SAND AND GRAVEL	--	16	8-59	--	--	D	L	--
31	DOLOMITE	LOCKPORT DOL	F	1-66	--	--	D	--	H_2S
53	SHALE	VERNON SH	26	--	10	3	D	--	--
--	SILTY SAND	--	11	6-66	--	--	--	--	--
105	SHALE	VERNON SH	--	--	4	--	D	--	--
24	SHALE	VERNON SH	F	--	--	--	D	--	HIGHLY "MINERALIZED"
7	SAND	--	--	--	--	--	D	--	--
--	TILL	--	22	9-60	--	--	--	L	--
--	SHALE	VERNON SH	28	10-59	--	--	--	J	IRON
87	SHALE	VERNON SH	56	4-60	10	3	D	--	--
--	SANDY TILL	--	2	6-66	--	--	--	--	--

Table 5.--Records of selected wells and test holes in the Western Oswego River basin (Continued)

WELL NUMBER AND LOCATION	OWNER OR NAME	METHOD DRILLED	DATE DRILLED (YEAR)	WELL USE	WATER USE	WELL DEPTH (FT.)	CASING DEPTH (FT.)	CASING DIAM-ETER (IN.)	WELL FINISH	ALTI-TUDE-OF LSD (FT.)
430753N0771955.1	WALWORTH NY	H	1965	T	U	31	--	8	X	495
430754N0764406.1	K CONROW	C	1959	W	S	18	18	6	O	470
430755N0771449.1	C ACKLEY	C	1963	W	H	100	75	6	X	515
430756N0771015.1	R VONHALL	C	1963	W	H	76	49	6	X	440
430801N0772046.1	WALWORTH NY	C	1966	T	U	58	36	12	X	480
430802N0765515.1	L FOX	C	--	W	H	96	--	6	O	440
430807N0772108.1	WALWORTH NY	H	1965	T	U	32	--	8	X	480
430808N0765734.1	S SAWMILL	C	--	W	C	124	65	6	X	460
430809N0765623.1	C FOX	C	1963	W	H	77	59	7	X	425
430809N0770836.1	R WAEGHE	C	1965	W	H	88	81	6	X	470
430810N0771552.1	WALWORTH NY	H	1965	T	U	23	--	8	X	470
430811N0770903.1	P DIETZ	D	--	W	H	24	--	40	W	470
430816N0771020.1	C JOHNSON	C	1962	W	H	94	78	6	X	500
430816N0771118.1	MARION NY	C	--	O	U	106	25	8	X	445
430816N0772113.1	WALWORTH NY	H	1965	T	U	19	--	8	X	490
430820N0771627.1	L DUELL	C	1963	W	H	119	84	6	X	545
430820N0771838.1	E GRACE	C	1957	W	H	86	84	6	X	500
430822N0771733.1	R YUKER	C	1959	W	H	47	39	6	X	530
430830N0771321.1	D FILIBEST	C	1960	W	H	67	56	6	X	515
430831N0771318.1	P FREELING	C	1963	W	H	100	75	6	X	514
430839N0770613.1	C FISHER	C	1954	W	H	61	60	6	X	505
430839N0771609.1	WALWORTH NY	H	1965	T	U	10	--	8	X	465
430842N0771606.1	WALWORTH NY	H	1965	T	U	35	--	8	X	460
430844N0764619.1	D YOUNGMAN	D	--	U	U	22	--	30	W	510
430845N0771239.1	N KLAVERT	C	1950	W	H	47	22	6	X	470
430848N0771112.1	WM COLD STORAGE	C	--	Z	U	31	15	6	X	450
430853N0764138.1	H CASELLA	C	1958	W	H	105	100	6	X	400
430853N0771112.1	MARION PRODUCE	C	--	W	N	31	14	6	X	460
430857N0763859.1	E TYLER	D	--	W	H	24	--	24	W	520
430858N0770713.1	P BLIEK	C	--	W	H	26	8	6	X	500
430901N0763903.1	G CROWELL	D	--	W	H	20	--	36	W	480
430902N0765719.1	HENDERSON	D	--	W	H	9	--	40	W	415
430904N0764623.1	K KLINE	D	--	W	S	12	--	36	W	440
430906N0771609.1	WALWORTH NY	H	1965	T	U	35	--	8	X	480
430907N0763859.1	G CROWELL	D	--	W	H	25	--	36	W	460
430909N0763904.1	K CROWELL	D	--	W	H	16	--	24	C	430
430911N0770539.1	J SHULLA	D	--	W	H	25	--	40	W	460
430912N0771031.1	W ELVE	C	--	W	H	53	15	6	X	450
430915N0770542.1	J SHULLA	D	--	U	U	13	--	40	W	460
430928N0764135.1	A BALDWIN	C	1950	W	H	177	165	6	X	490
430939N0765102.1	A VANKOUWENBURG	C	--	W	H	74	64	6	X	440
430950N0763908.1	SCHULER FARMS	C	--	W	H	100	--	6	X	420
431000N0763625.1	H MUHLNICKEL	C	1959	W	H	82	78	6	X	460
431021N0764307.1	C BURGHDORF	B	1930	U	U	154	90	6	X	500
431031N0763910.1	N HARE	D	1922	W	H	13	--	30	C	420
431033N0771650.1	WALWORTH NY	C	1965	T	U	64	38	12	X	480
431034N0771650.1	WALWORTH NY	H	1965	T	U	32	--	8	X	480
431130N0771543.1	U S GOVT	C	1966	W	H	120	105	6	X	565
431140N0771031.1	C MASON	C	--	W	H	80	56	6	X	460
431142N0770836.1	R HERMENET	C	1963	W	H	72	69	6	X	510

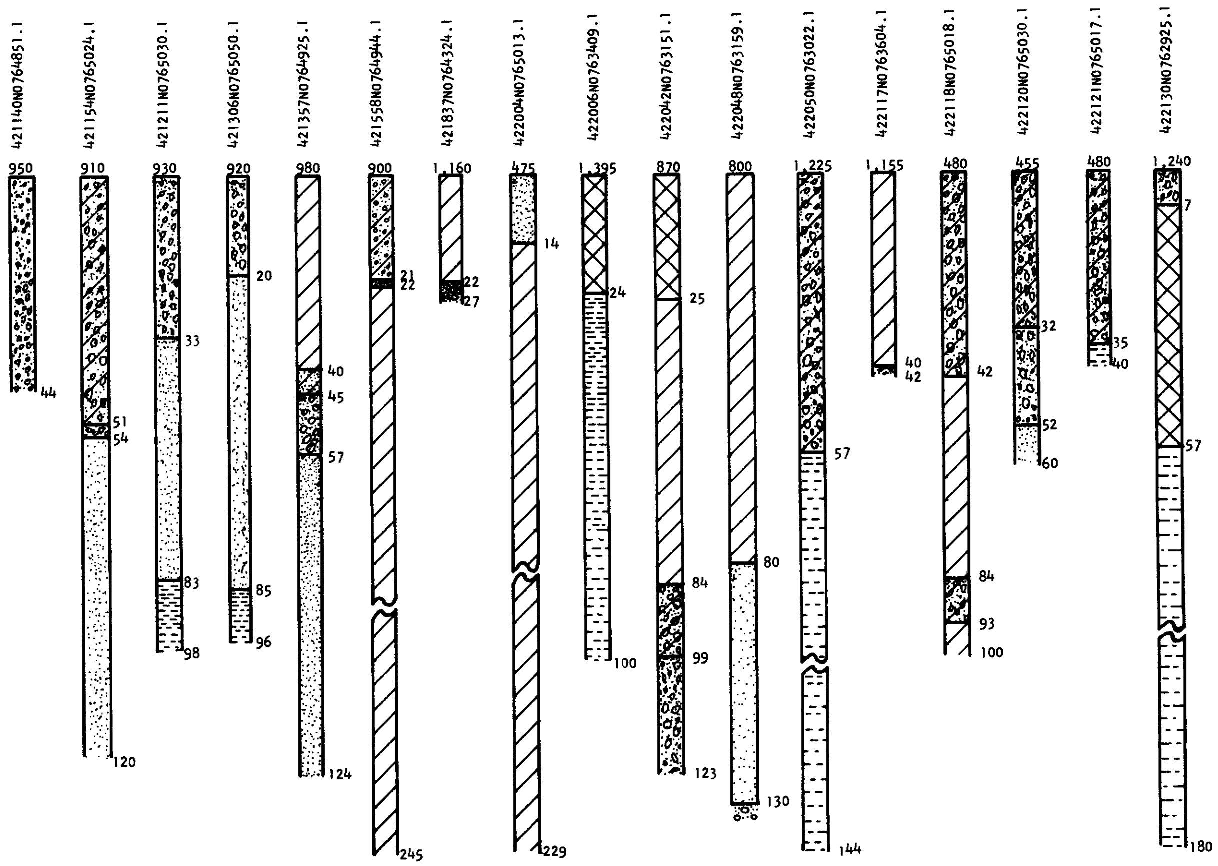
DEPTH TO CONSL. ROCK (FT.)	WATER-BEARING MATERIAL	FORMATION	WATER LEVEL (FT.)	WATER LEVEL DATE MEAS.	YIELD (GPM)	YIELD (METHOD DETER-MINED)	LOG AVAIL-ABLE	QW TYPE	REMARKS
26	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SAND AND GRAVEL	--	2	3-59	15	3	D	L	--
72	SHALE	VERNON SH	35	--	13	3	D	--	--
48	SHALE	VERNON SH	23	9-63	5	3	D	--	--
36	DOLOMITE	LOCKPORT DOL	3	2-66	80	3	D	--	--
--	TILL	--	20	--	--	--	--	--	--
30	SAND AND GRAVEL	--	--	--	--	--	D	--	--
65	DOLOMITE	LOCKPORT DOL	24	--	100	6	D	P	SOURCE OF WATER MAY BE SAND
58	SHALE	VERNON SH	25	-63	20	3	D	--	--
63	SHALE	VERNON SH	18	5-65	25	3	D	--	--
21	SAND AND GRAVEL	--	--	--	--	--	D	--	--
--	SILTY SAND	--	6	--	--	--	--	--	--
77	SHALE	VERNON SH	30	5-62	30	3	D	P	--
25	DOLOMITE	LOCKPORT DOL	19	8-64	100	--	--	--	--
17	DOLOMITE	LOCKPORT DOL	--	--	--	--	D	--	--
80	DOLOMITE	LOCKPORT DOL	64	--	9	3	D	C	--
84	DOLOMITE	LOCKPORT DOL	23	--	3	3	D	--	--
39	DOLOMITE	LOCKPORT DOL	--	--	6	3	--	--	H_2S
56	SHALY DOLOMITE	LOCKPORT DOL	27	--	--	--	D	--	--
72	SHALY DOLOMITE	LOCKPORT DOL	35	8-63	13	3	D	--	--
60	SHALE	VERNON SH	36	--	25	3	D	--	--
5	DOLOMITE	LOCKPORT DOL	--	--	--	--	--	--	--
33	DOLOMITE	LOCKPORT DOL	--	--	--	--	D	--	--
--	TILL	--	19	9-60	--	--	--	L	--
22	DOLOMITE	LOCKPORT DOL	16	6-66	--	--	--	P	--
15	SHALY DOLOMITE	LOCKPORT DOL	--	--	300	--	--	--	--
100	SHALE	VERNON SH	+3	9-60	--	--	--	L	IRON
14	SHALY DOLOMITE	LOCKPORT DOL	--	--	250	--	--	C	--
--	TILL	--	18	10-59	--	--	--	L	--
8	DOLOMITE	LOCKPORT DOL	10	--	3	--	D	--	--
--	TILL	--	9	10-59	--	--	--	J	--
--	TILL	--	3	5-66	--	--	--	--	--
--	TILL	--	7	9-60	6	--	--	L	--
32	DOLOMITE	LOCKPORT DOL	--	--	--	--	D	--	--
--	TILL	--	15	10-59	--	--	--	L	--
--	TILL	--	14	10-59	--	--	--	L	INADEQUATE IN SUMMER
--	TILL	--	--	--	--	--	--	--	--
15	DOLOMITE	LOCKPORT DOL	20	--	5	--	D	P	--
--	TILL	--	4	6-66	--	--	--	--	--
165	SHALE	VERNON SH	75	--	20	3	--	L	--
64	DOLOMITE	LOCKPORT DOL	20	--	--	--	--	C	--
--	SHALE	VERNON SH	--	--	--	--	--	J	SALTY
45	SHALE	VERNON SH	8	10-59	3	3	D	L	IRON
90	DOLOMITE	LOCKPORT DOL	77	4-65	2	--	--	P	H_2S
--	SAND AND GRAVEL	--	9	10-59	--	--	--	J	--
38	DOLOMITE	LOCKPORT DOL	1	12-65	--	--	D	--	--
30	SAND AND GRAVEL	--	--	--	--	--	D	--	--
105	DOLOMITE	LOCKPORT DOL	72	6-66	4	3	D	--	H_2S
56	DOLOMITE	LOCKPORT DOL	--	--	1	--	D	--	H_2S
68	DOLOMITE	LOCKPORT DOL	--	10-63	5	3	D	--	--

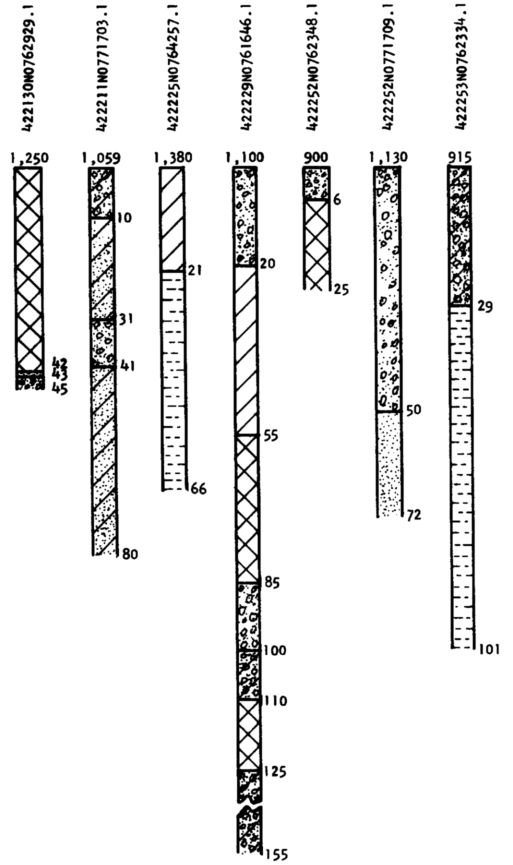
Table 6.--Records of selected springs in the Western Oswego River basin

Spring number and location	Owner	Water-bearing material	Altitude above sea level (feet)	Yield (gpm)	Date of yield meas.	Use 1/	Remarks
425042N0764135.1	General Products Co.	Onondaga Limestone	410	1,300+	10-10-66	N	Flow is considerably greater in the spring; complete chemical analysis.
425104N0764555.1	Unknown	Onondaga Limestone	440	800+	4-16-65	H	Flow generally ranges from 100 to 2,000 gpm; partial chemical analysis.
425157N0764455.1	F. Keller	Onondaga Limestone	390	270	5-22-65	U	Flow varies seasonally; partial chemical analysis.
425705N0764555.1	Unknown	Sand	410	30	8-18-66	U	"Spring" is actually artesian aquifer uncovered by pipeline ditch; partial chemical analysis.
430440N0764243.1	Unknown	Sand	380	0	10-18-66	U	Seasonal; reported to be site of old Galen Salt Works; partial chemical analysis.

1/ H, Domestic; N, Industrial; U, Unused.

Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin





EXPLANATION

Locations of wells and test holes are shown in plate 1. Well and test-hole logs have been generalized in some cases for consistency. Otherwise, terminology used by drillers and other sources of information was closely followed in preparing table 7 and may not always agree with geologic interpretations. For example, a few wells shown as penetrating carbonate rock are interpreted in table 5 as tapping shale. Some materials shown in table 7 as silt, clay, sand, and gravel, or as silt and clay, are probably tills; however, their hydrologic properties would be similar.

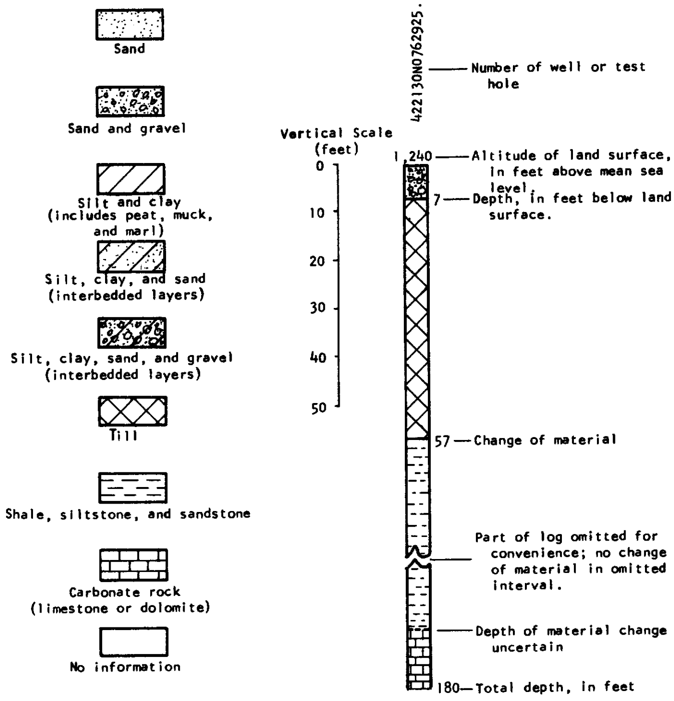


Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)

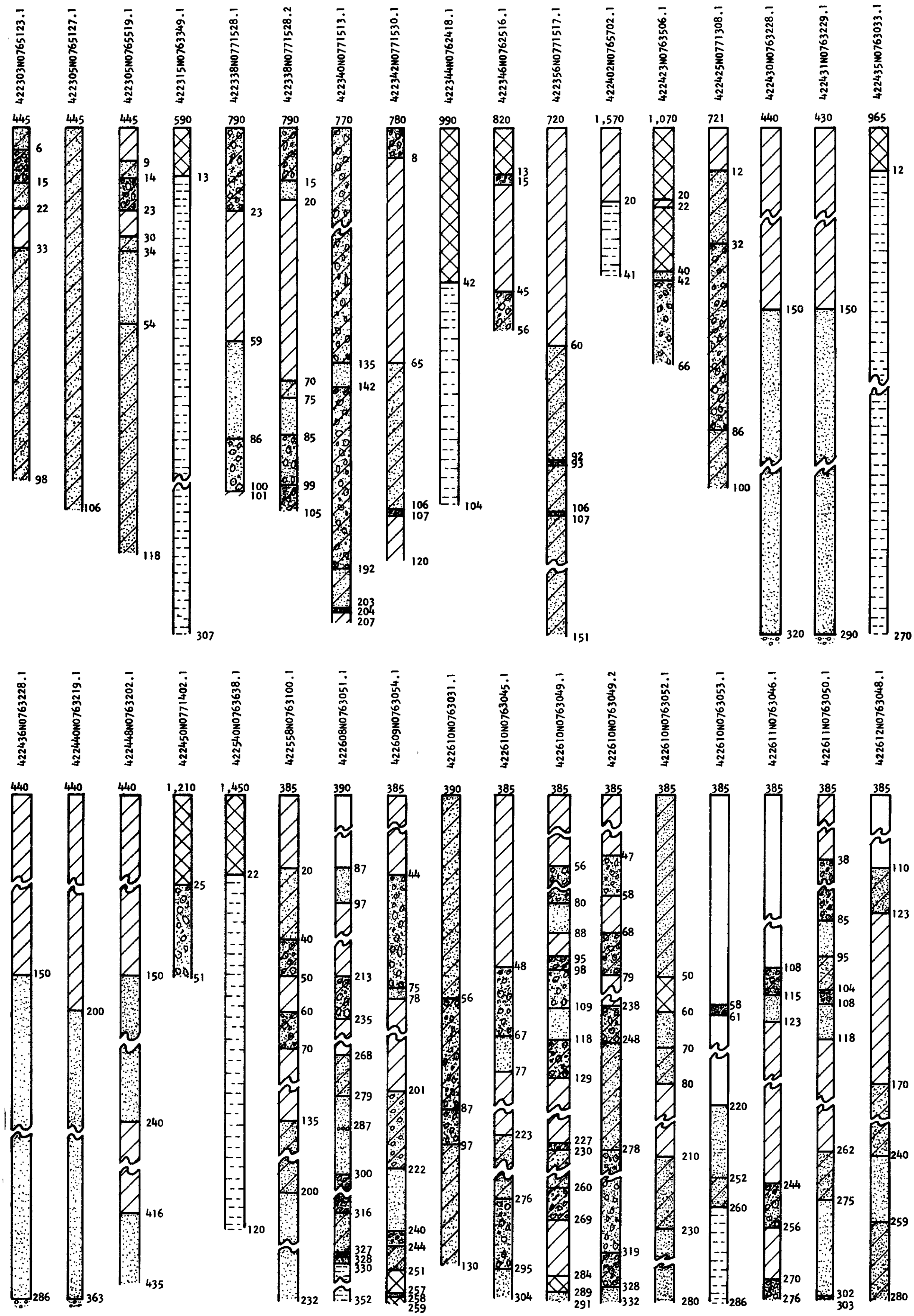


Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)

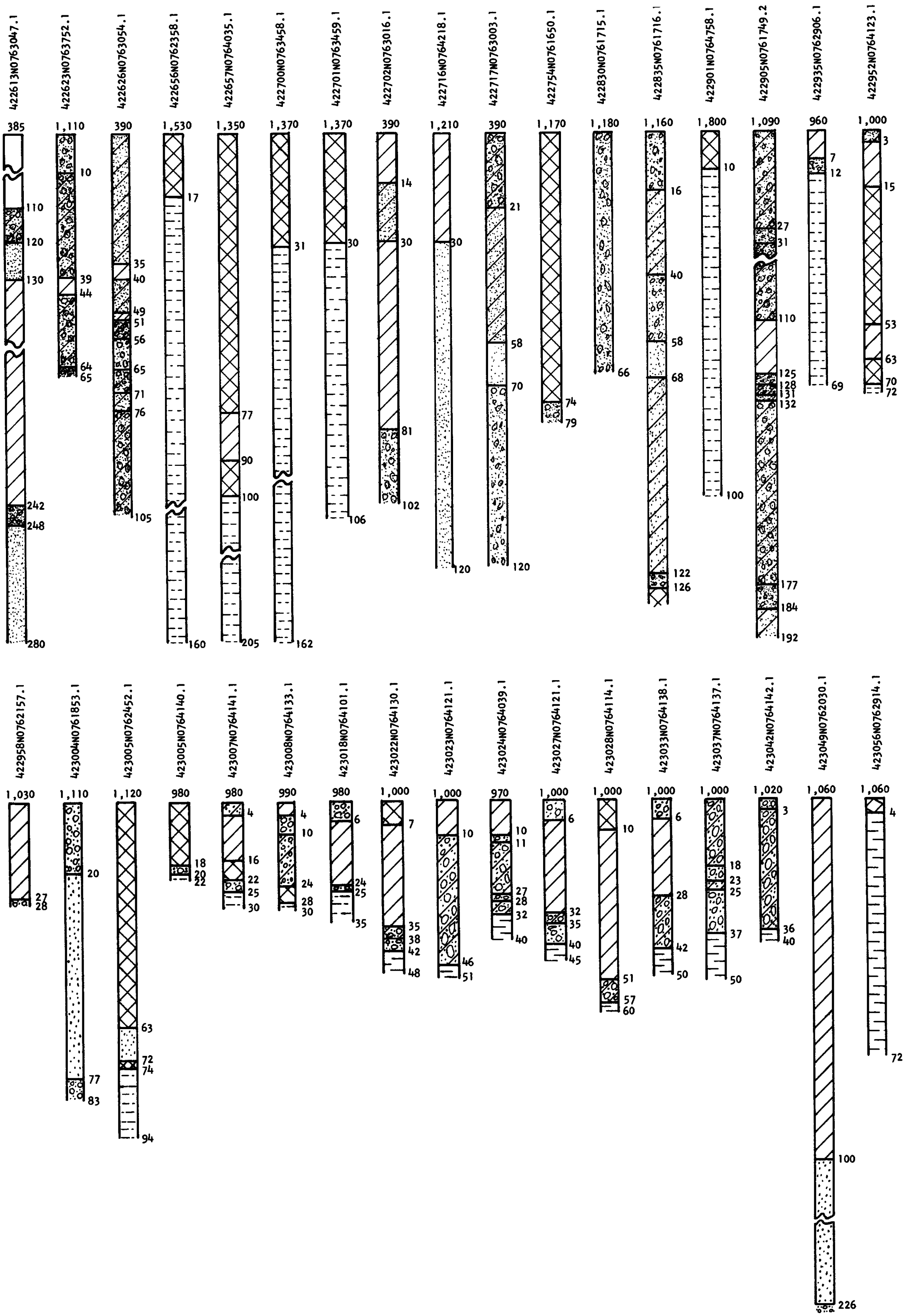
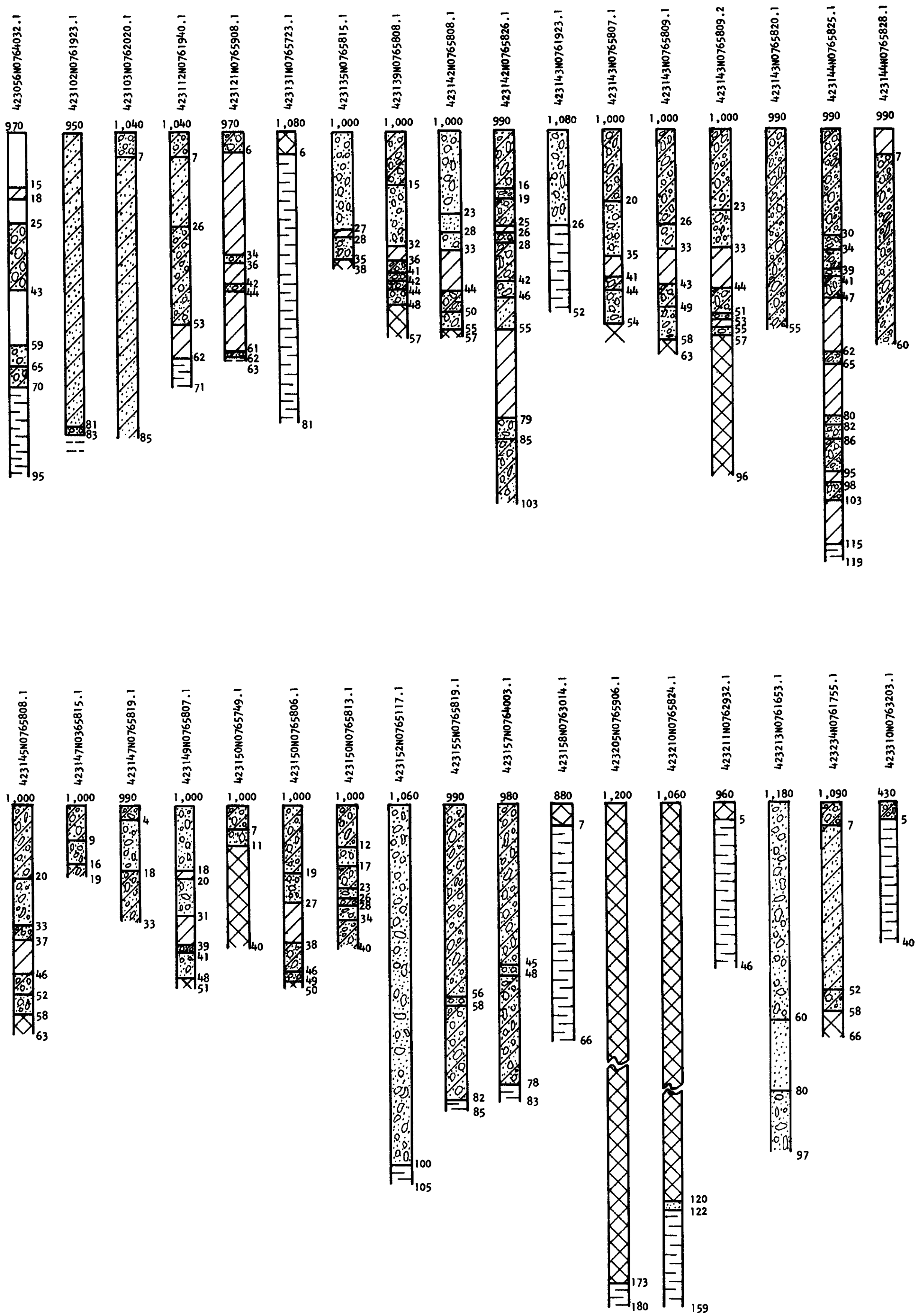


Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)



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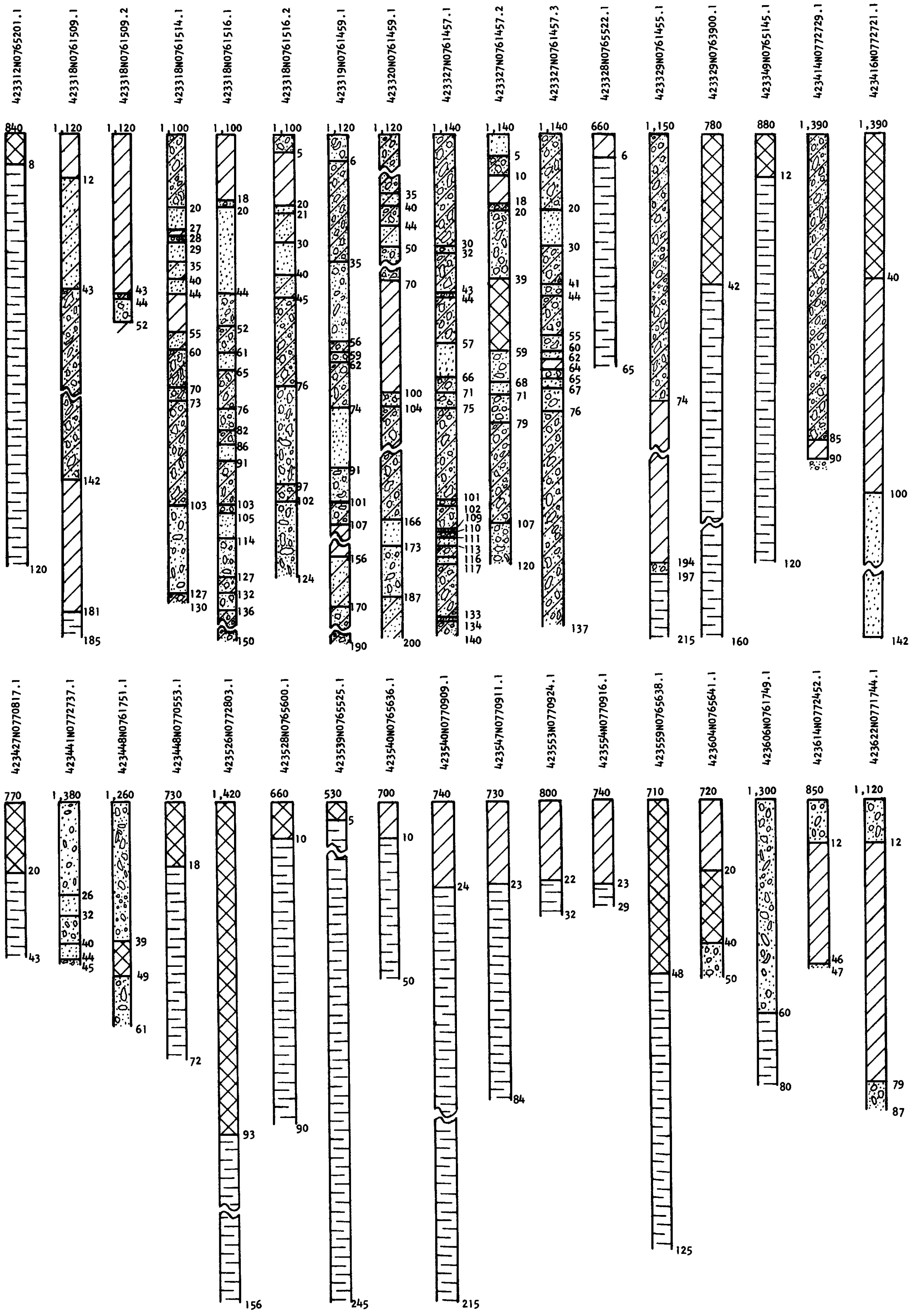

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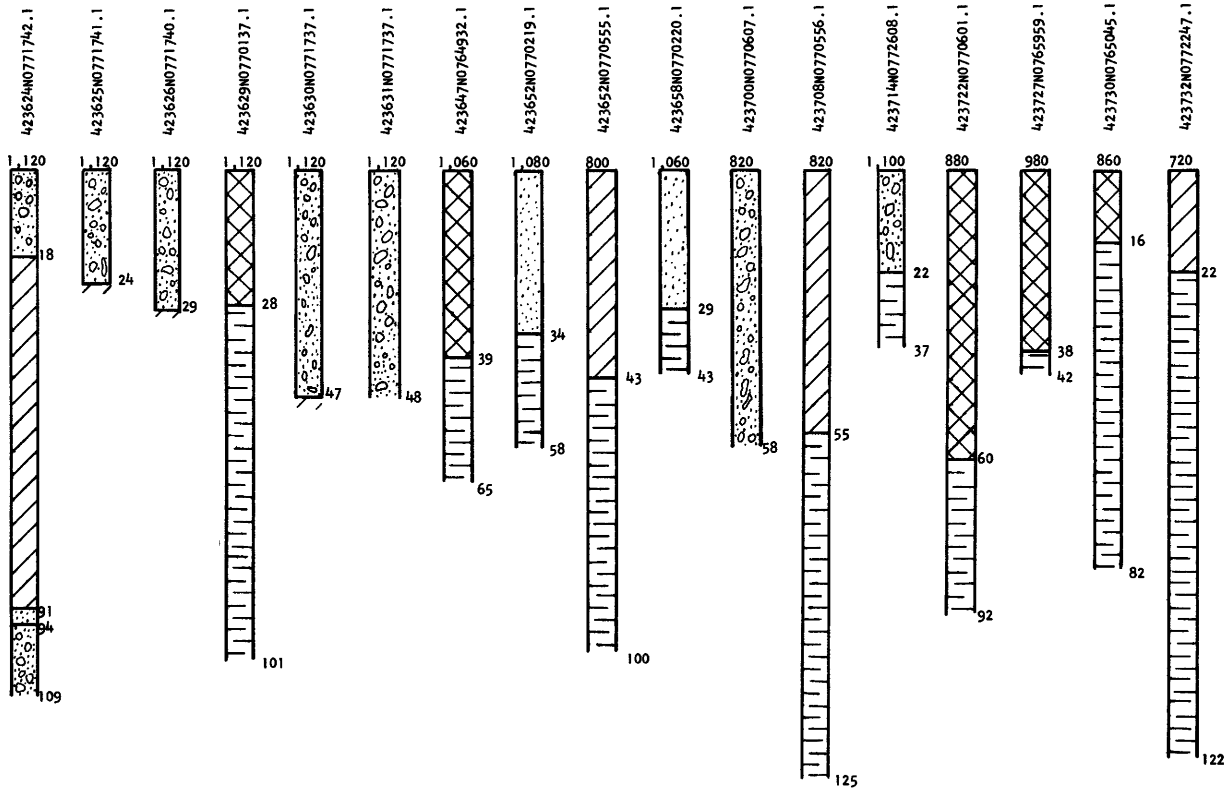

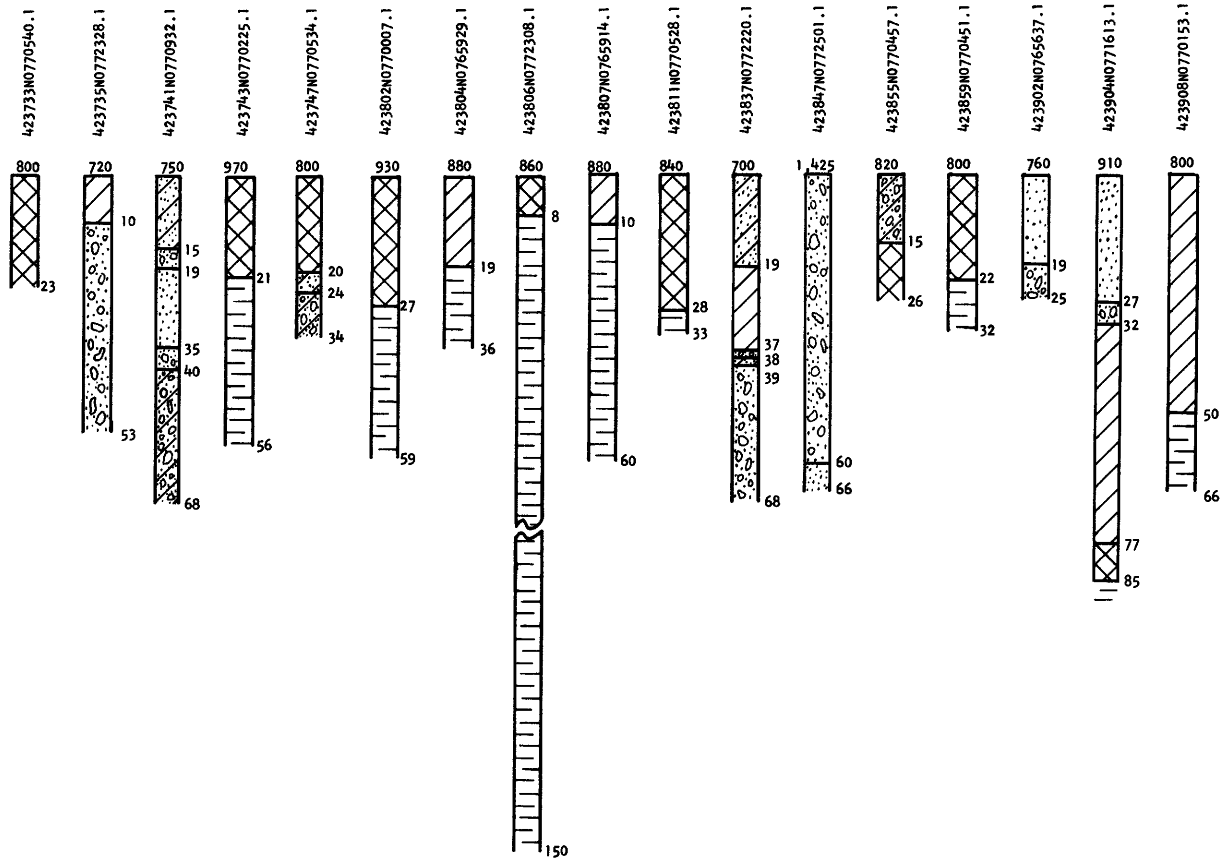

Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)

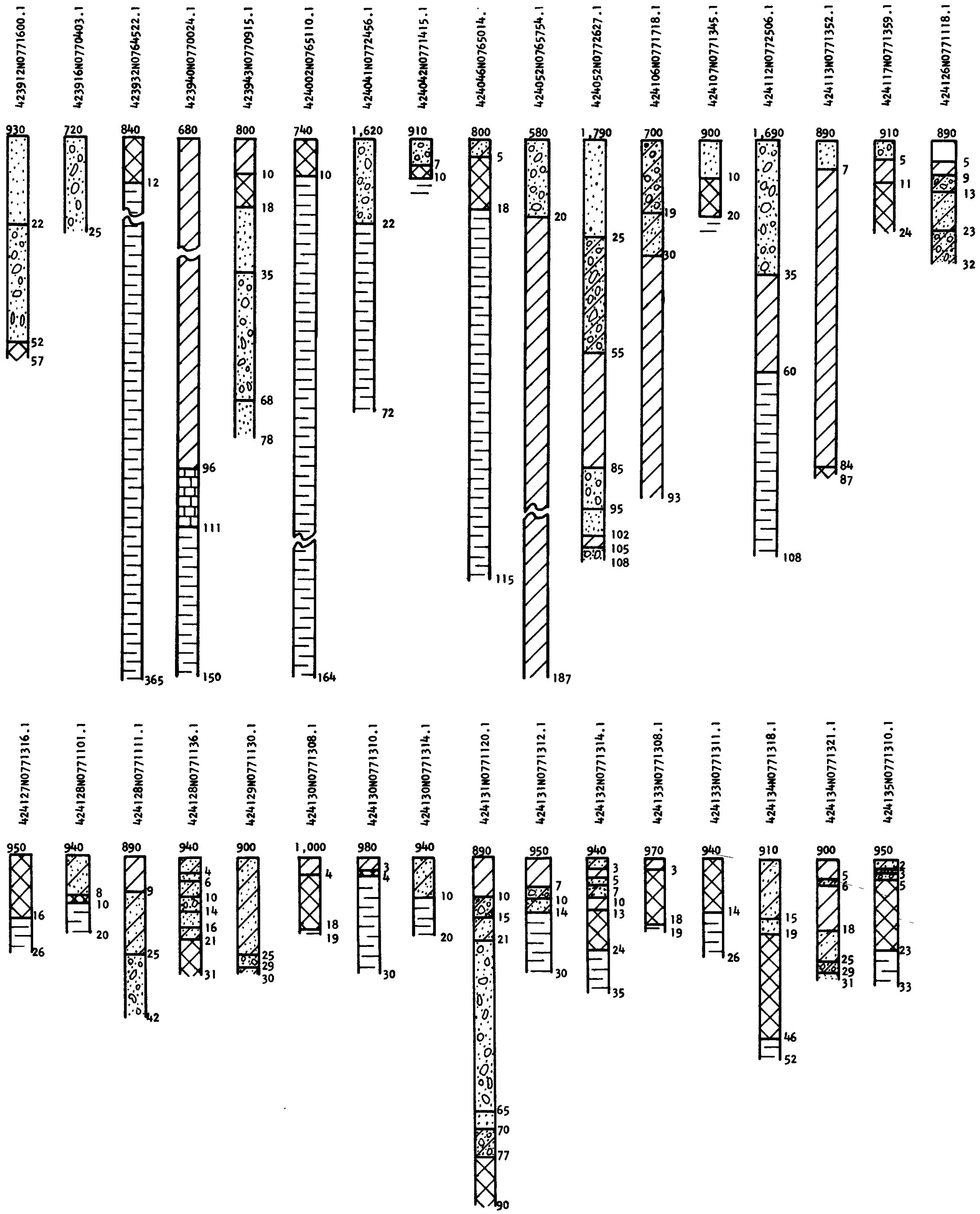

Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)

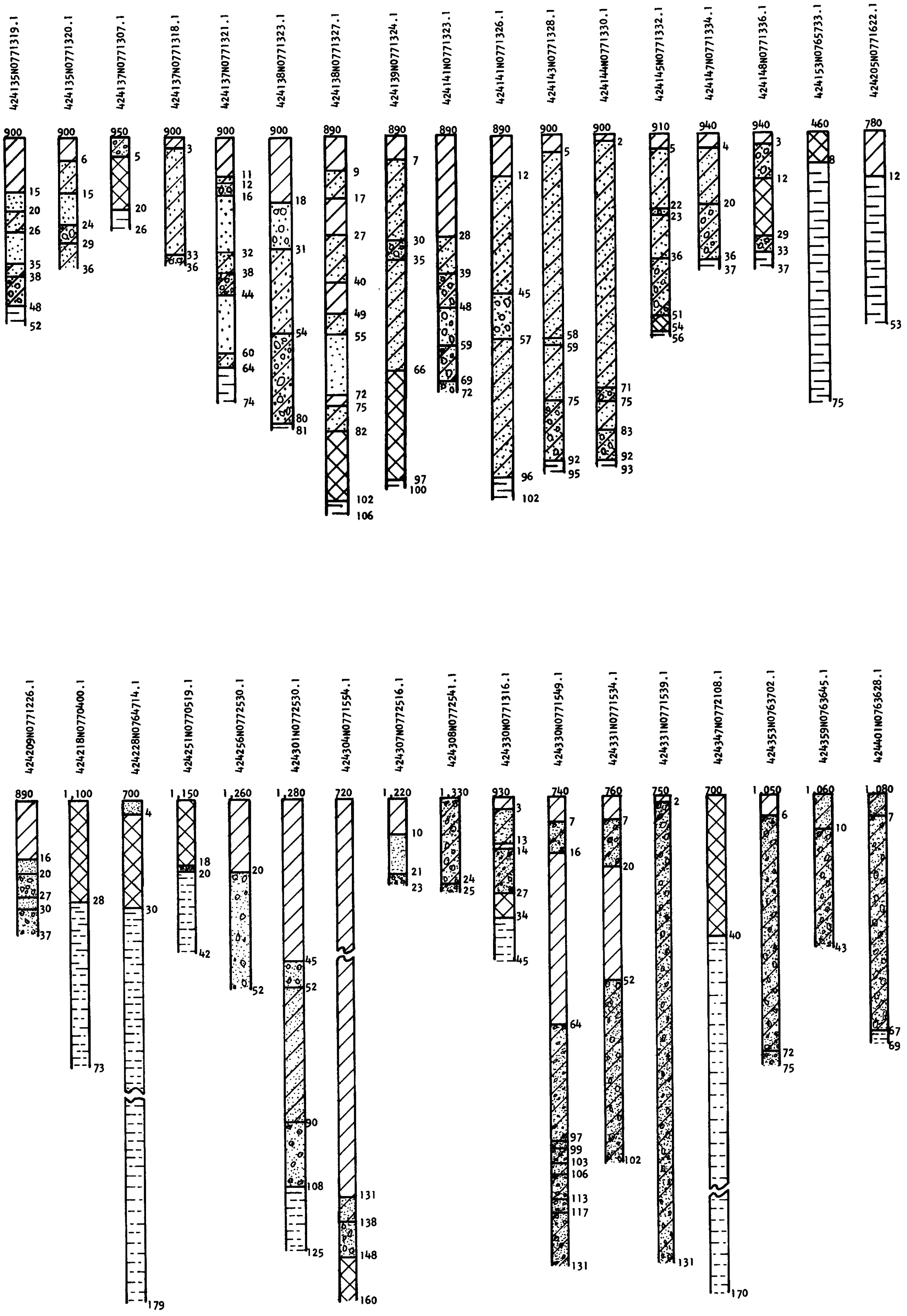

Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)

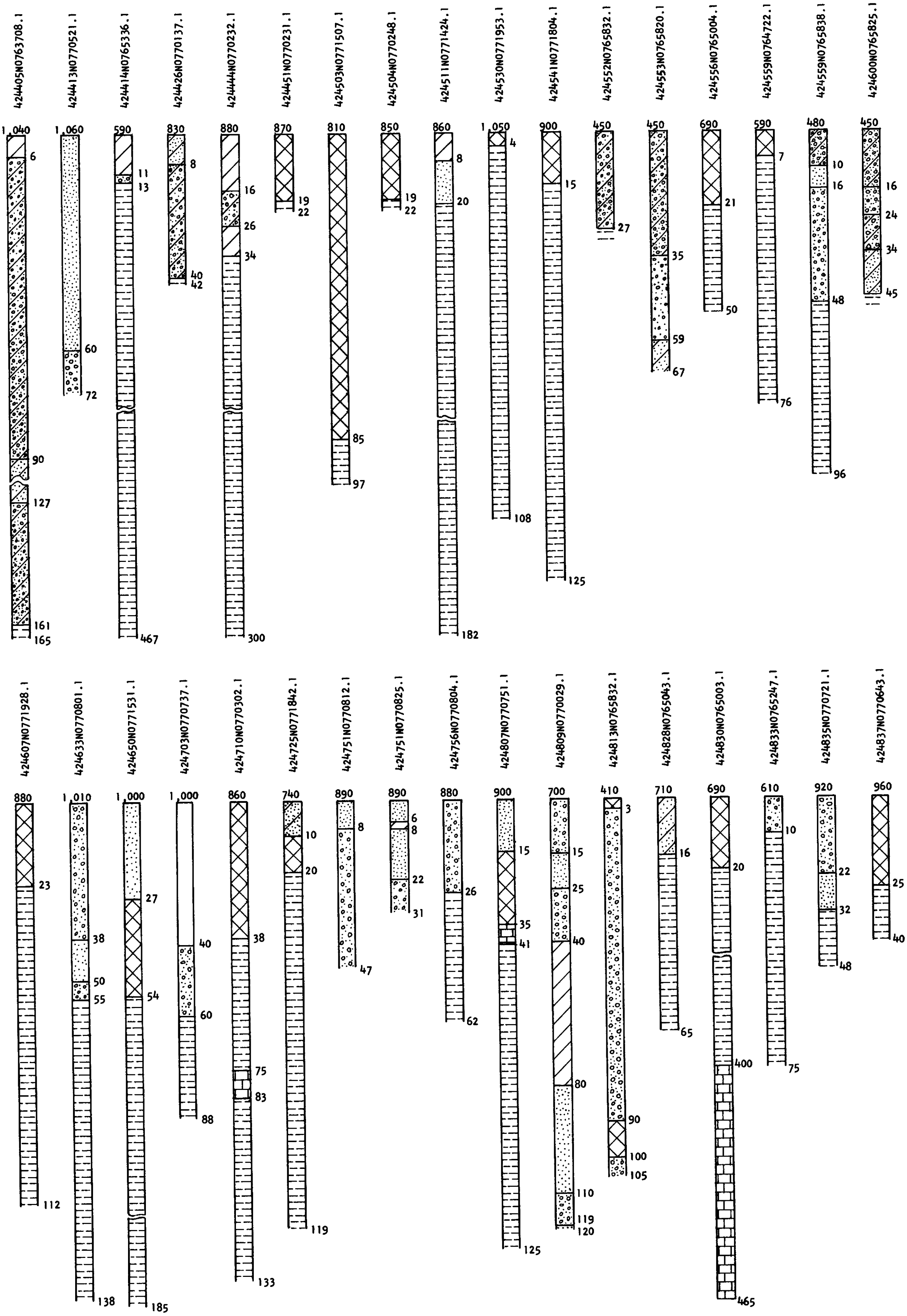

Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)

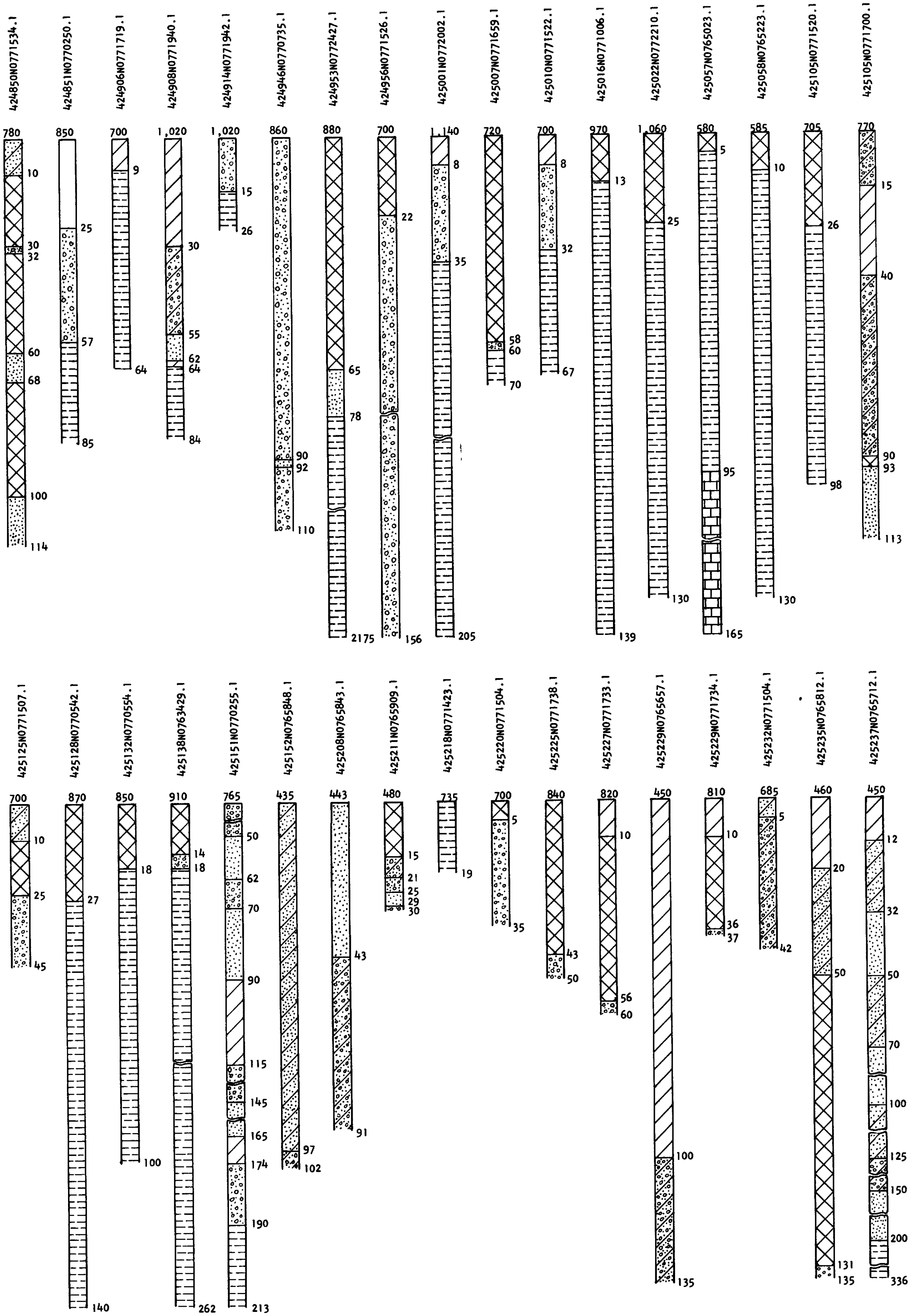

Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)

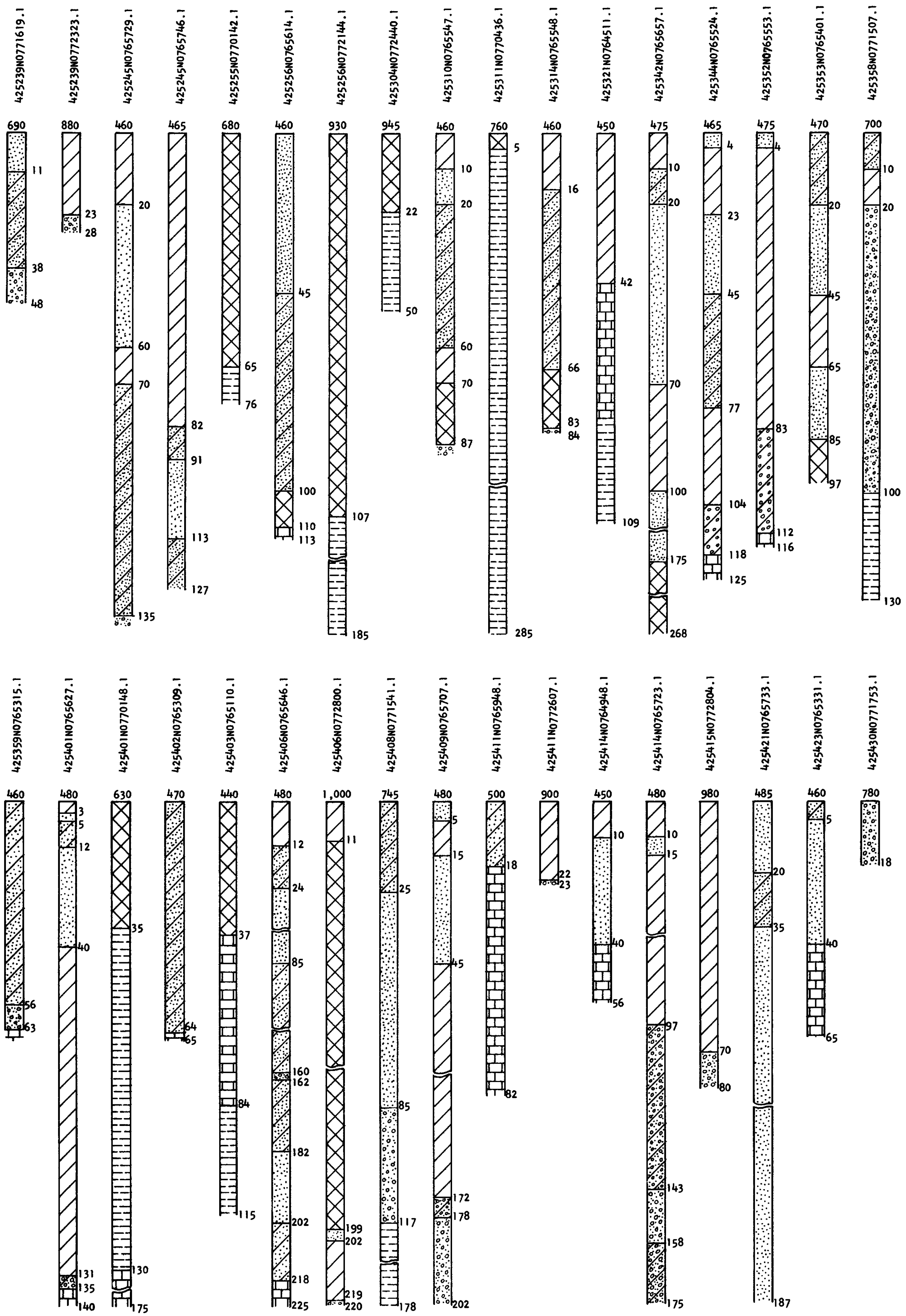

Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)

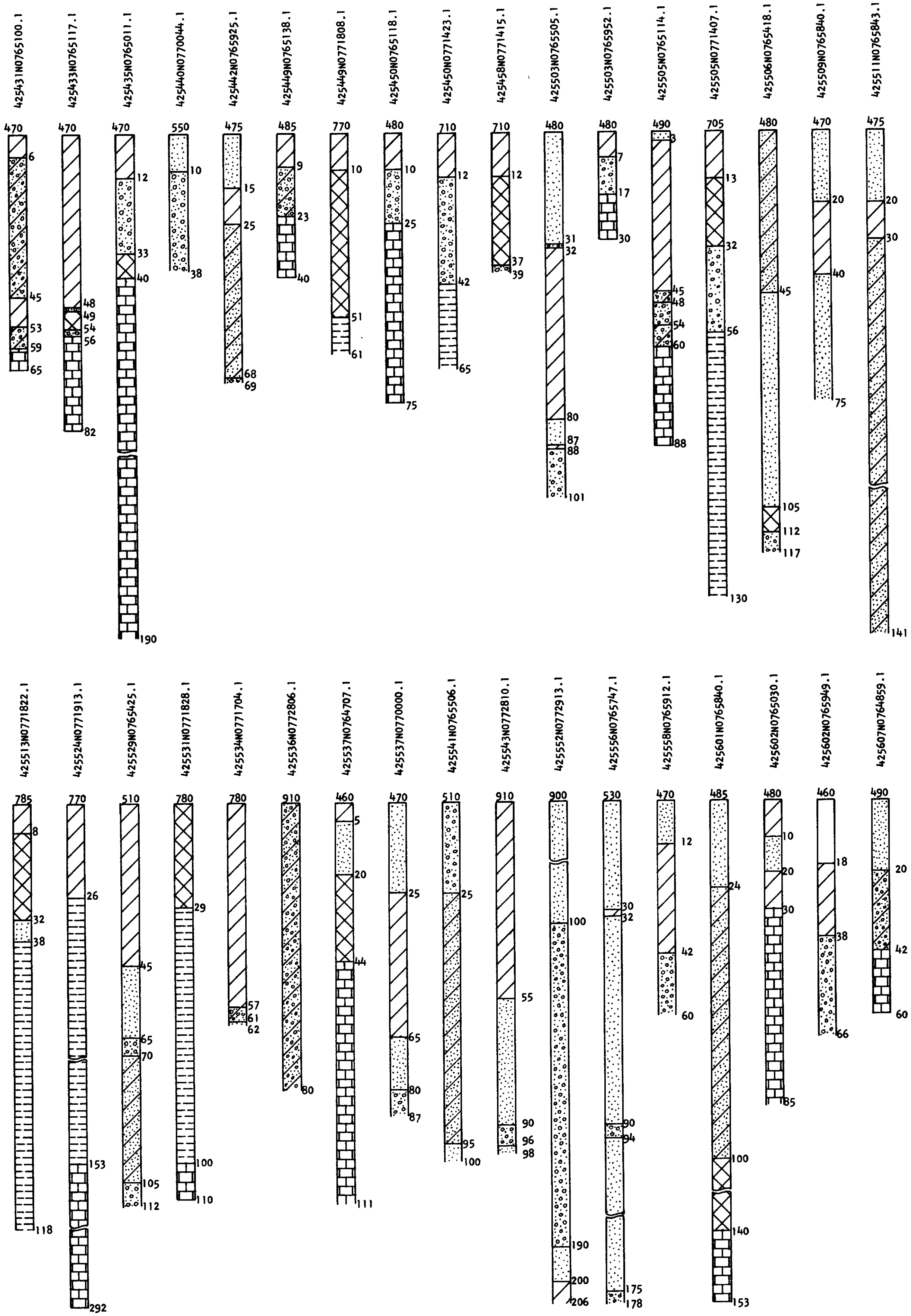

Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)

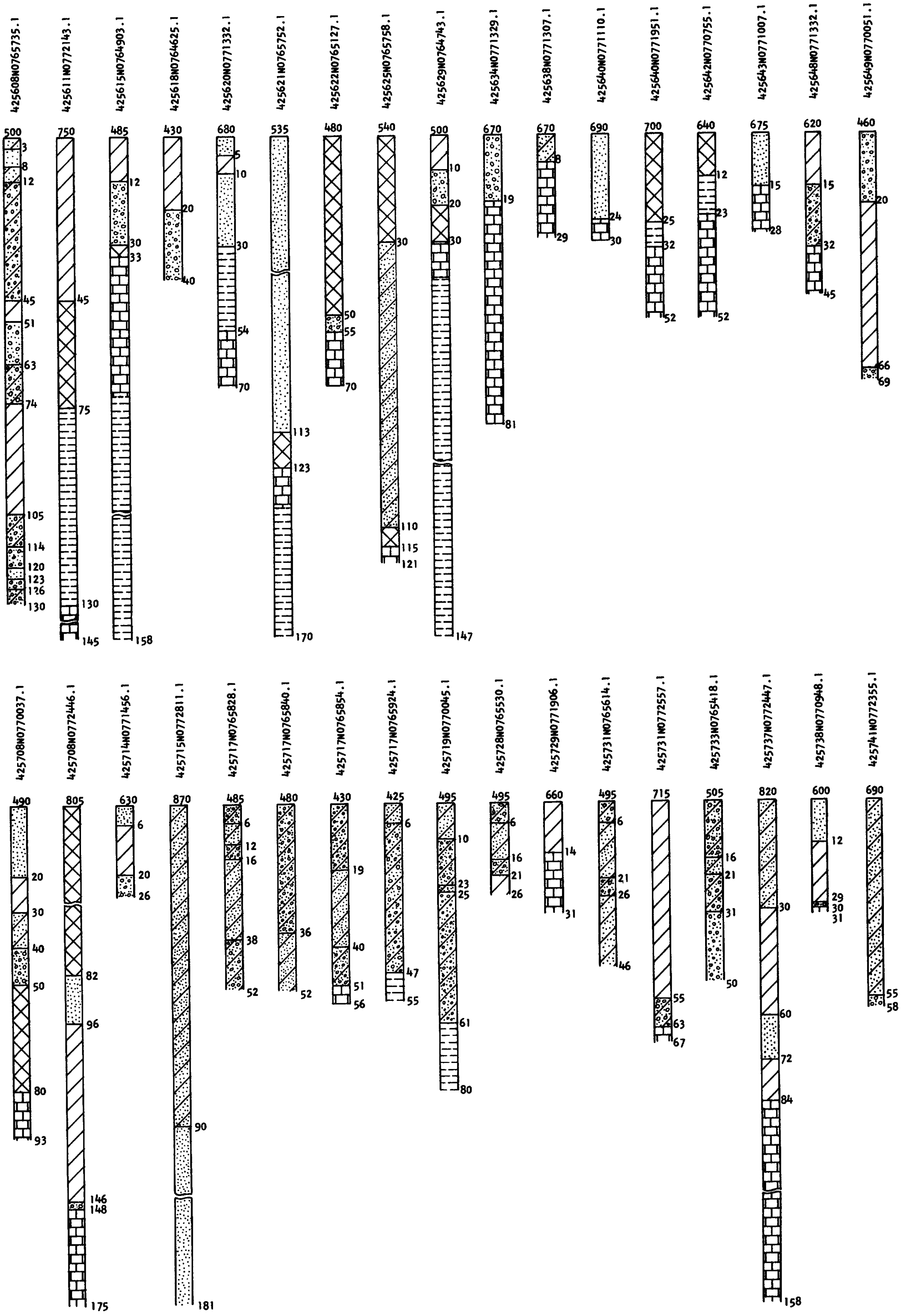

Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)

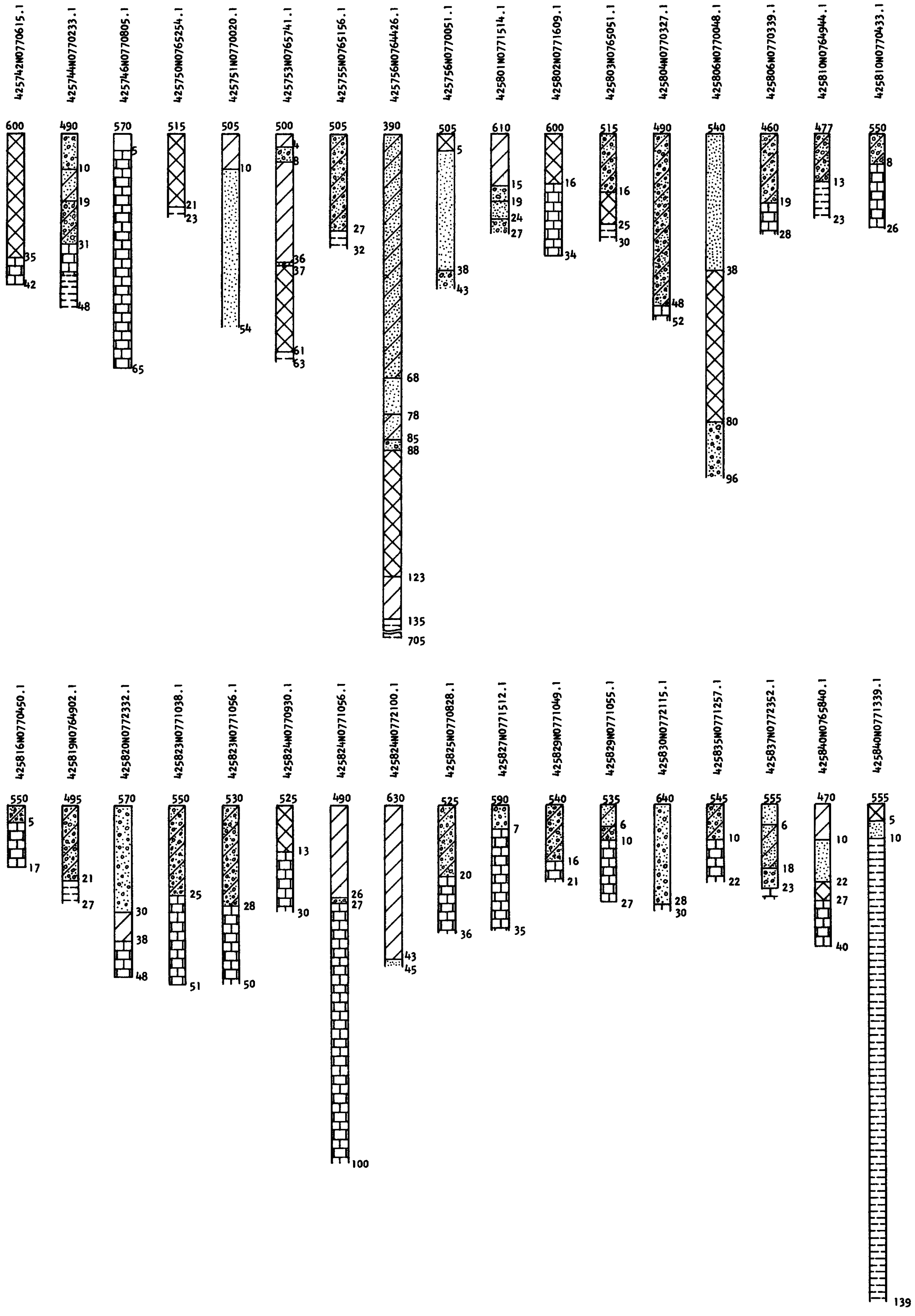

Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)

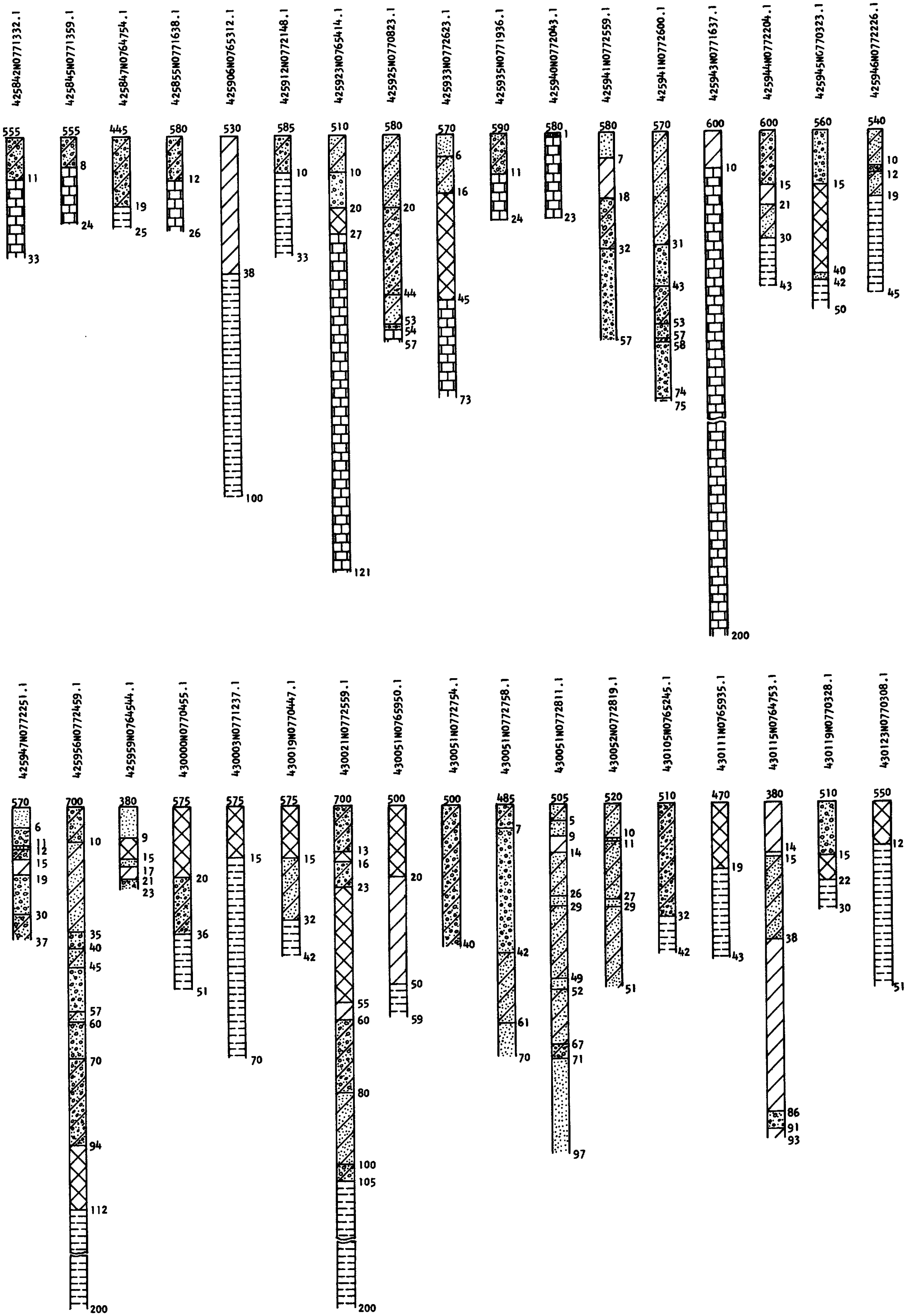

Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)

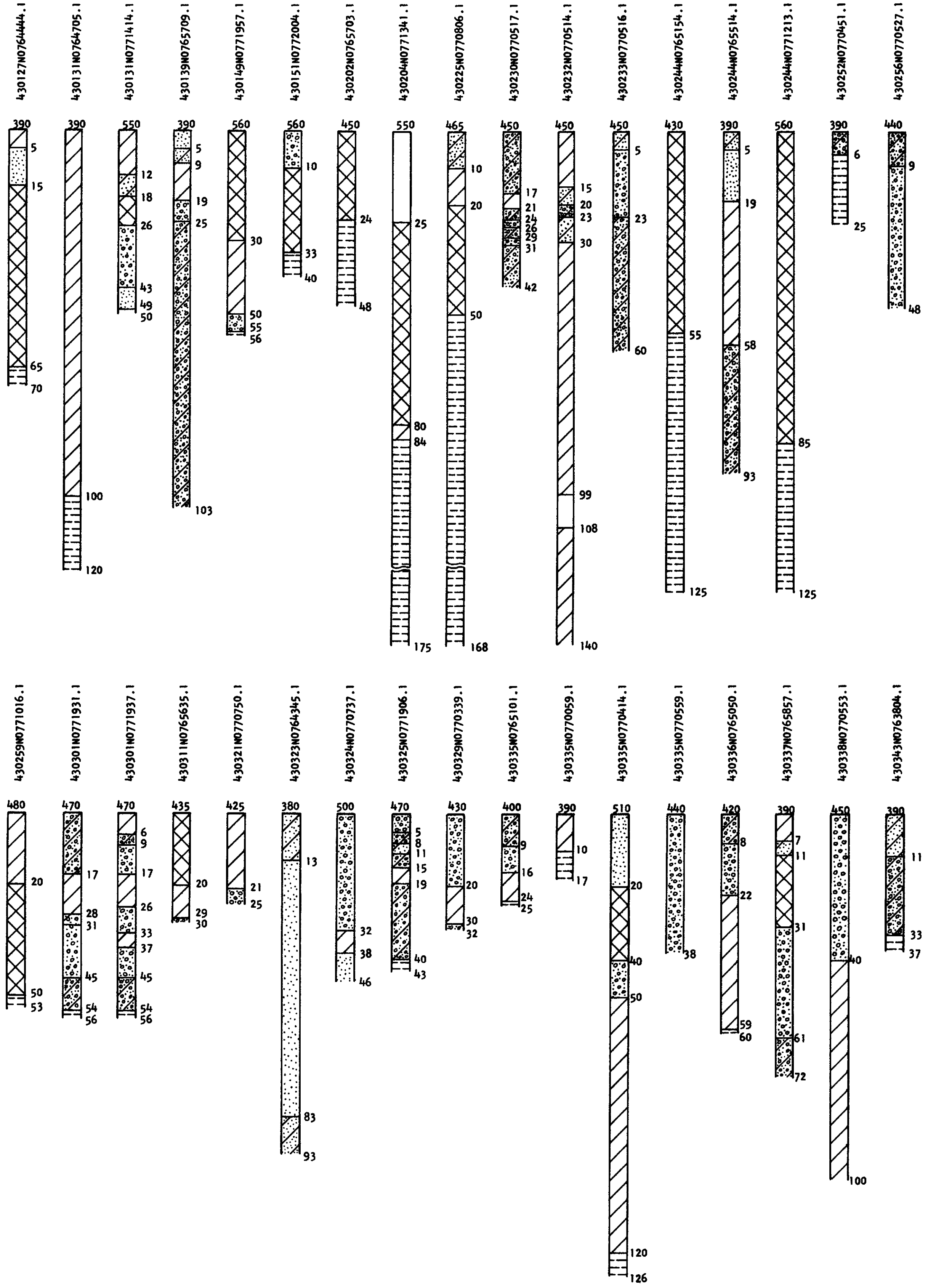

Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)

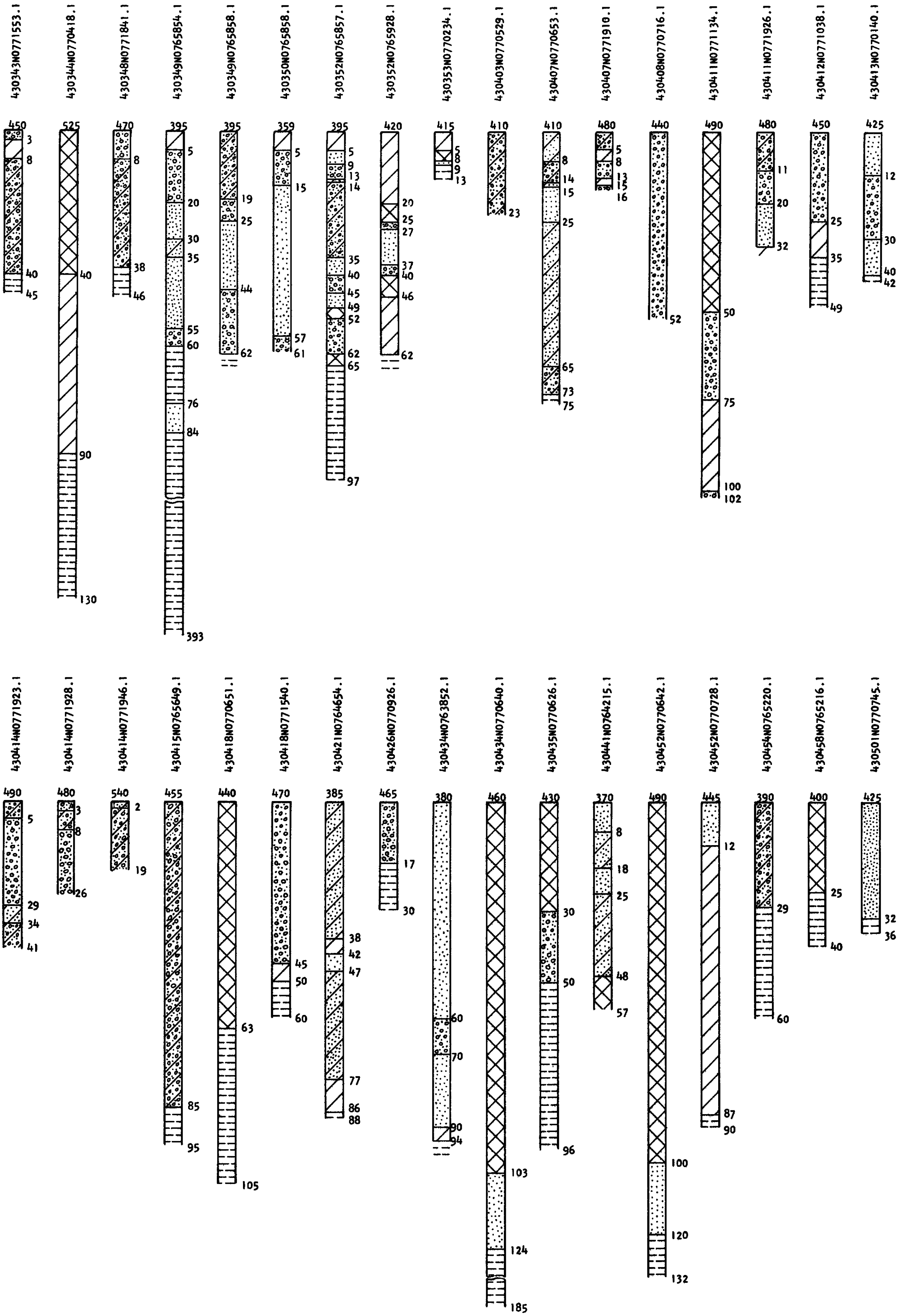

Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)

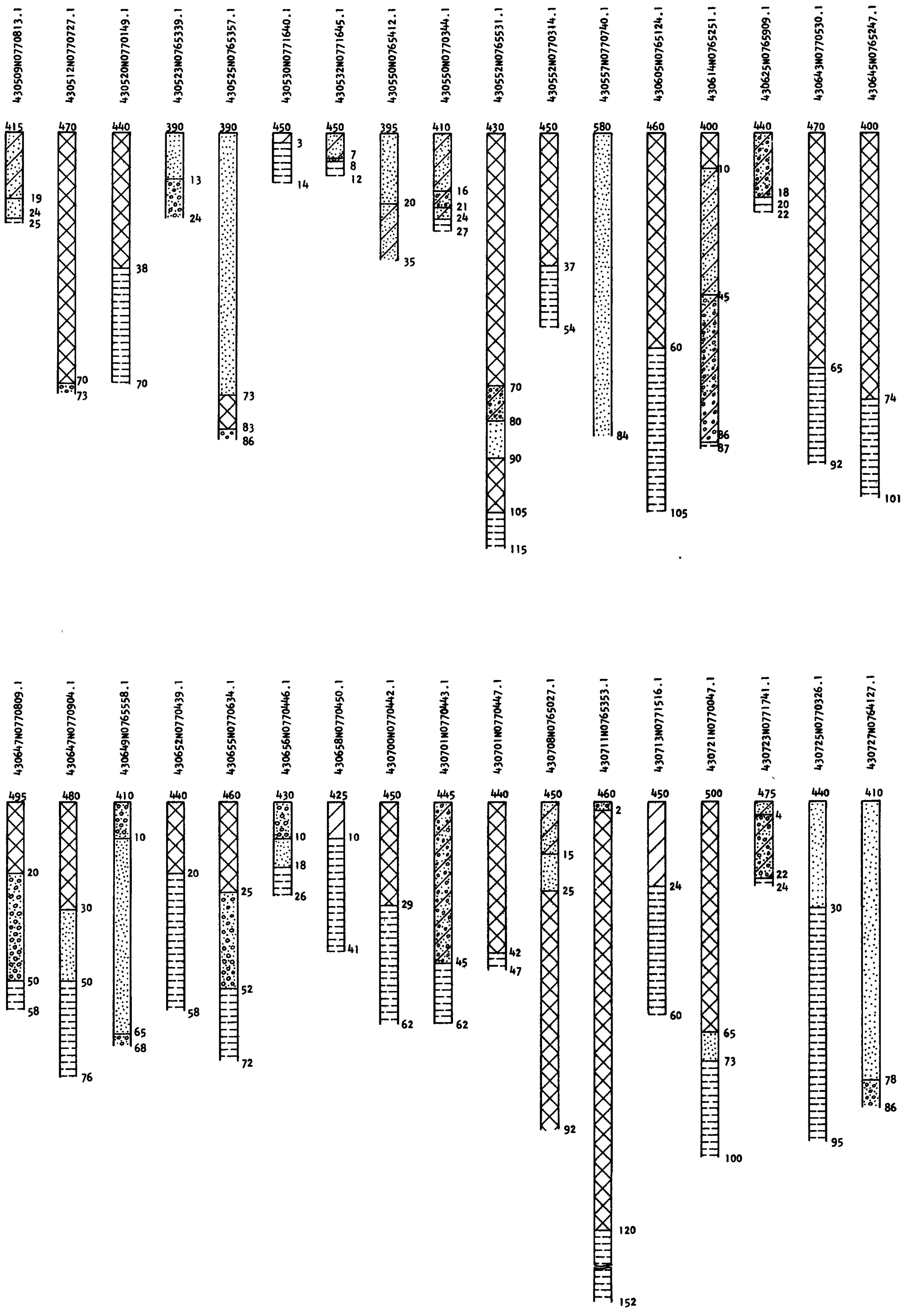

Table 7.--Graphic logs of selected wells and test holes in the Western Oswego River basin (Continued)